Draft NCCP/HCP Planning Guidelines

Southern Subregion

Orange County, California

April 2003

DRAFT NCCP/HCP
PLANNING GUIDELINES

Southern Subregion
Orange County, California

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SECTION 1: NCCP/HCP GUIDELINES INTRODUCTION

1.1 Purpose of the Guidelines

The draft Planning Guidelines for the Southern Subregion NCCP/HCP ("NCCP/HCP Guidelines") are intended to provide an objective and common set of planning considerations and recommendations for use by the resource and regulatory agencies and the program participants in selecting and evaluating reserve program, restoration and management alternatives for the Southern Subregion NCCP/HCP. The NCCP/HCP Guidelines are comprised of three primary components:

1. NCCP Tenets outlined in the 1993 NCCP Conservation Guidelines;

2. Reserve Design Principles prepared by the panel of NCCP Science Advisors convened by The Nature Conservancy; and

3. A set of draft "work in progress" sub-basin specific planning recommendations prepared by the NCCP Consultant Team.

These guidelines are also complemented by the Watershed & Sub-basin Planning Principles prepared to address the protection and management of aquatic resources within the planning area. The consultant team has also prepared additional general planning area resource protection, management and restoration policies which should be considered for incorporation into reserve design planning.

The draft NCCP Guidelines are a "work in progress" prepared by the NCCP/SAMP working group. These guidelines represent a synthesis of the following source materials:

- The NCCP Conservation Guidelines, including the seven Tenets of Reserve Design, prepared by the Scientific Review Panel appointed by the CDFG (1993);

- The Principles of Reserve Design and Adaptive Management Principles for the Southern Subregion prepared by the Science Advisors convened by The Nature Conservancy to assist in the preparation of the Southern NCCP (1998); and

- Southern Subregion databases.

These guidelines do not: 1) commit to conserve or allow impacts to specific biological and hydrological resources; or 2) discount specific biological and hydrological resources that are not identified herein. As the public preparation and review process for the NCCP/HCP continues, it is anticipated that new planning information and analyses could modify the assessment of the significance of specific resources, including the initial protection, management, and restoration

recommendations. Thus, the specific language in the NCCP/HCP Guidelines will continue to be reviewed and modified as appropriate.

Using the broader NCCP Tenets as a framework and starting point, the NCCP/HCP Guidelines provide guidance for decision-makers that is keyed to local biologic, hydrologic, and geomorphic conditions. These guidelines address resources at both the landscape and more detailed hydrologic/geomorphic sub-basin levels. For each sub-basin planning unit, the Guidelines identify the important biological resources and key hydrologic/geomorphic processes. Protection recommendations also are included, providing an objective and common set of planning considerations and recommendations for use in selecting and evaluating Habitat Reserve design, restoration and adaptive management alternatives.

The draft NCCP/HCP Guidelines also reflect other non-biological objectives in keeping with the purpose and need of the NCCP/HCP to provide a subregional approach to protecting identified species and their habitats while allowing for compatible economic uses. Accordingly, application of the planning recommendations is consistent with the Science Advisors recognition that the NCCP "reserve design principles are not absolutes and ". . . that it may be impractical or unrealistic to expect that every design principle will be completely fulfilled throughout the subregion" (Science Advisors, May 1997).

1.2 Relationship of Guidelines to Other Planning Program Criteria

The participants in the Special Area Management Plan/Master Streambed Alteration Agreement (SAMP/MSAA) process have also developed tenets and principles for the identification and evaluation of alternatives. The U.S. Army Corps of Engineers (ACOE) and California Department of Fish and Game (CDFG) set forth eight SAMP/MSAA Tenets characterized as overall program goals intended to facilitate the identification of alternatives that meet the project purpose and need. The participants have also jointly collaborated on a set of Watershed and Sub-basin Planning Principles ("Planning Principles"). The Planning Principles are intended to function in a similar manner as the NCCP Science Advisors reserve design principles. Reserve Design Principle 7 was added by the Science Advisors in recognition of the role that hydrologic and sediment processes play in shaping the landscapes of the planning area. This principle helps to integrate the NCCP/HCP and SAMP/MSAA processes and serves as a link between this set of guidelines and the tenets and principles of the SAMP/MSAA.

The Watershed Planning Principles and the NCCP/HCP Guidelines described in this document are applied at the sub-basin scale as a response to the distinct characteristics (geomorphic, hydrologic and biologic) of each of the sub-basins. Both the Watershed Planning Principles and the NCCP/HCP Guidelines use the same sub-basin units/boundaries as the basis for addressing site-specific resource protection and management. This facilitates and makes more effective a comparison of the effects of the proposed respective guidelines/principles for both the NCCP/HCP and SAMP/MSAA programs. It is important to understand that the NCCP/HCP Guidelines and

Watershed Planning Principles will not always treat the same biologic and hydrologic resources in the same manner. Use of common sub-basin planning units enables program participants and the public to identify and address those instances where the different approaches and priorities inherent in the NCCP/HCP and SAMP/MSAA programs create the need for reconciliation of differing protection and management recommendations.

1.3 Format of Document

Section 1 provides an introduction to the NCCP Guidelines.

Section 2 of this document contains materials intended to provide basic planning principles that can be used throughout the planning area and species information for listed and other selected species in the planning area, as follows:

- Section 2.1 contains the NCCP Tenets outlined in the 1993 Conservation Guidelines.

- Section 2.2 sets forth the Science Advisors translation of the NCCP Tenets to Subregional Design Principles.

Section 3 sets forth general policies for resource protection, management and restorations that apply at the planning (landscape) area scale. These general policies also address:

- The protection and maintenance of wildlife movement corridors and habitat linkages;
- Creation and management of urban/wildland interface areas;
- Fuel management; and
- Grazing management.

Section 4 provides species accounts and key physical habitat components of listed and other selected planning species in the planning area.

Section 5 identifies and discusses resource planning considerations at the sub-basin scale. This section reflects the need to identify key planning principles that both reflect and address the distinctive characteristics of each of the sub-basins. Each sub-basin description and analysis includes:

- A summary of the Existing Conditions and Biological Resources that represent important planning consideration in the sub-basin.

- A summary of Planning Recommendations for the sub-basin. Planning recommendations are broken down into three categories; protection, management and restoration.

Section 6 reviews in more detail the restoration and management recommendations for each sub-basin and explains how these recommendations could contribute to an overall Habitat Reserve design and future adaptive management program.

1.4 Relationship to Species Downstream and Outside the Planning Area

In addition to the listed and other selected planning species that occur within the Southern Subregion planning area and the hydrologic/sediment resources occurring within the Orange County portions of the San Mateo Creek watershed, other listed species and hydrologic resources of significance occur downstream of the planning area. Potential downstream impacts and mitigation measures will be addressed in the CEQA/NEPA documents for the NCCP/HCP and SAMP/MSAA. From an NCCP/HCP perspective, potential downstream impacts will be considered from a species needs, terrains, hydrology and water quality perspective. This consideration will include information regarding watershed processes and species needs gained in formulating the NCCP Guidelines.

SECTION 2: PLANNING AREA TENETS AND PRINCIPLES

2.1 NCCP Tenets

Seven basic Tenets of Reserve Design were outlined in the NCCP Conservation Guidelines (November 1993). These tenets were elaborated upon in the Coastal/Central NCCP and repeated here for planning purposes:

1. **Conserve target species throughout the planning area**: Species that are well distributed across their native ranges are less susceptible to extinction than are species confined to small portions of their ranges.

   Reserves should represent the full range of physiographic conditions which support the three target species (California gnatcatcher, cactus wren and orange-throated whiptail), such as the immediate coastal terrace/frontal slopes along with more inland areas, lower along with higher elevations, and different vegetational assemblages.

2. **Larger reserves are better**: Large blocks of habitat containing large populations of the target species are superior to small blocks of habitat containing small populations.

   Reserve units should include the largest practical numbers of target species, thereby minimizing the instabilities inherent in smaller populations. This objective must be balanced against the need to identify reserve boundaries which are manageable and viable in the long term.

3. **Keep reserve areas close**: Blocks of habitat that are close to one another are better than blocks of habitat far apart.

   The distance between blocks of habitat should be well within the distance that can be traveled by dispersing individuals of the target species, particularly the two birds. Because available data indicate that dispersal distances of less than a mile are usual and less than two miles are common, blocks of habitat which support target species should be no more than one or two miles apart wherever practical. The presence and type of linkages affect this objective.

   Linkages which require animals to cross "gaps" should ideally consist of narrow gaps with broad "landing zones" on either side. Organisms which "jump" from one are thus much more likely to successfully land on the other side of the linkage. Gaps at the ends of long narrow fingers of habitat pointing toward each other are less likely to be successfully transited, and are less desirable.

4. **Keep habitat contiguous**: Habitat that occurs in less fragmented, continuous blocks is preferable to habitat that is fragmented or isolated by urban lands.

To the degree possible, reserve blocks of core habitat should be on the order of a 1,000 or more acres. In this community and setting, reserve habitat blocks in the 100 or more acre range may require special management efforts to remain viable, and reserve habitats in the 10-acre range will often not be viable in the long run. (Note that these numerical targets should be interpreted according to the specifics of habitat blocks: for example, a well-connected and nearly round block in the high 100's of acres may function better in the reserve than a long and narrow "dead end" block in the low 1,000s of acres, and an archipelago of smaller blocks may remain viable under some circumstances). This objective applies to the blocks of habitat making up the core of the reserve, but it may sometimes be necessary and desirable to include small blocks of habitat at strategic locations for habitat linkages.

5. **Link reserves with corridors**: Interconnected blocks of habitat serve conservation purposes better than isolated blocks of habitat.

   Linkages allow for genetic exchange, recolonization of habitat following perturbations, and operation of the "rescue effect" for small populations. Linkages within subareas are more important in terms of the latter two functions, while linkages between subregions are more important for genetic exchange. A linkage functions if enough animals transit the linkage often enough for these functions to occur; and a linkage does not have to allow completely unimpeded movement of individual organisms to function. The important individuals are those which are actively dispersing, most often juveniles.

   Corridors which are large enough to include habitat sufficient for several home ranges (i.e., "live-in" habitat) may not require an organism to successfully transit the entire linkage when dispersing, and thus are more likely to allow flow of individuals between populations. For this reason, they are preferable to smaller corridors. Similarly, they may be somewhat longer than the distance most individual organisms disperse. These habitat linkages, which represent linear patches of native habitat connecting large blocks, may function as both corridor (for larger animals) and habitat (for smaller, less fragile species).

   Corridors function best when they contain native habitat (e.g., coastal scrub, chaparral, riparian) or non-native habitats readily crossed by target species (e.g., annual grassland, ruderal habitats dominated by mustard). Non-habitat linkages function best when the land cover within them physically resembles the habitat preferred by target species. Culverts, agricultural fields, golf courses, and other non-native landscape features that lack barriers to dispersal may function as corridors, especially for important non-target species such as coyote.

   Linkages are more likely to function if individual animals can see (or otherwise sense) suitable habitat within or beyond the corridor. Linkages which cross canyons or road

cuts (where elevation allows animals to see across) are thus preferable to corridors obscured by topography, development, and/or ornamental vegetation.

Multiple, or redundant corridors are preferable where linkages are longer than normal dispersal distances, include gaps which much be "jumped," include visual barriers, and/or include significant non-habitat components (e.g., golf course, fuel modification zones).

6. **Reserves should be biologically diverse**: Blocks of habitat should contain a diverse representation of physical and environmental conditions.

   The reserves should include other habitat types that may occur in a mosaic pattern with coastal sage scrub and contribute to the long-term protection and management of the coastal sage scrub reserve system. Reserve boundaries should be drawn to include other habitat types which occur within a manageable physiographic unit (e.g., a canyon or ridge system) containing coastal sage scrub. Small exclusions of other habitat types which produce a highly interdigitated boundary or pockets of development should be avoided.

   Larger areas typically support a greater species richness owing to increased habitat heterogeneity in larger patches.

7. **Protect reserves from encroachment**: Blocks of habitat that are roadless or otherwise are inaccessible to human disturbance better serve target species than accessible habitat blocks.

   In the Southern Subregion, the greatest potential for encroachment is from urban edges surrounding reserve lands. Encroachment by non-native species (e.g., non-native grasses and exotic weeds) may reduce the habitat quality and value of reserve lands and thereby lower their carrying capacity. Edges are also the most likely ignition points for wildfire. For these reasons, the reserve boundary should minimize perimeter to area (P/A) ratio and avoid highly interdigitated configurations. (A circle has the smallest P/A ratio.)

   The above objective must be balanced against needs for firebreaks or other features to inhibit large-scale spread of ecological catastrophes and infrastructure/access for reserve management and passive recreation uses.

2.2 Science Advisors Translation of Tenets to Subregional Reserve Design Principles

The NCCP Science Advisors elaborated upon the general NCCP tenets set forth in Section 2.1 with a series of reserve design principles and recommendations developed specifically for the Southern Subregion. For ease of use, these principles and recommendations are summarized in this section, and are set forth in their entirety in APPENDIX A:

- Potential reserve sites should be prioritized based on the presence or potential presence of species or other ecological phenomena in the following five categories:

    1. Legally protected species
    2. Rare plant or habitat associations
    3. Upper trophic level or generalist species
    4. Locally rare species
    5. Species indicative of select habitat types

- Reserves should capture the environmental gradient, both within and among habitat types. This includes the elevation gradient, the coast/inland gradient, and variability among soils, vegetation and habitat types.

- Reserve design should seek, in order of priority:

    1. Continuity within habitat
    2. Connectedness
    3. Proximity

- Reserve design should strive to maintain the contiguity of large intact habitat blocks and not fragment them internally.

- Reserve design should attempt to minimize physical and visual barriers between reserves, particularly those reserves that are close together.

- Development around reserves should be directed to existing disturbed areas everywhere possible and away from native communities.

- Linkages should follow landscape features and respond to patterns of dispersal exhibited by species considered in reserve design. These linkages should be designed to serve the widest array of species by providing characteristics required for dispersal by the most wide-ranging organisms (mountain lion, bobcat, coyote, red-diamond rattlesnake).

The Science Advisors also specifically identified important habitats and specific uplands and riparian areas within the subregion.

- Several important grassland areas occur within the subregion. They are valuable for a variety of vertebrate species of concern, including badger, burrowing owl, spadefoot toad and horned lark. Also the ecotone between coastal sage scrub and grassland is important for California gnatcatchers. Important grassland areas are Gobernadora, Chiquita, upper Gabino, and Cristianitos.

- Reserve selection should favor increasing open space and *de facto* permanent natural areas, or reserves should be in close proximity to those areas. They include:

    - Donna O'Neill Land Conservancy at Rancho Mission Viejo
    - Caspers Wilderness Park
    - O'Neill Regional Park
    - Open Space in Upper Trabuco
    - Wagon Wheel Park (General Thomas F. Reilly Regional Park)
    - Camp Pendleton
    - Cleveland National Forest

- Ridgetop connectivity between Canada Gobernadora and Bell Canyon is important.

- Several key riparian systems occur within the subregion, including along San Juan Creek, Trabuco Creek, and the San Mateo Creek drainage (Gabino and Cristianitos creeks). Maintaining the integrity of these systems is important for a wide variety of species.

- Several canyons are important for nesting raptors, including Gabino, La Paz, Cristianitos and Talega canyons.

- Maintaining the integrity of riparian systems (including major stream courses and their tributaries) is very important for both vertebrates and invertebrates in:

    - San Mateo Drainage (Cristianitos and Gabino creeks)
    - San Juan Creek
    - Trabuco Creek
    - Gobernadora Creek

To address the importance of hydrologic and erosional process, the Science Advisors combined two previous tenets and added this seventh tenet to ensure that reserve design planning would account for the hydrologic and erosional processes that shape the landscapes of the planning area:

- The reserve system should protect intact hydrologic and erosional processes, including both normal function and extreme events (flooding, earthflow). Reserve design should protect to the maximum extent possible the hydrology and erosion regimes of riparian systems, especially in Cristianitos, San Juan and Trabuco drainages.

This tenet is more fully addressed in the SAMP/MSAA Watershed & Sub-basin Planning Principles, but is addressed in this document as appropriate for certain habitats and species.

SECTION 3: GENERAL POLICIES FOR PROTECTING, MANAGING AND RESTORING HABITAT SUPPORTING SELECTED SPECIES

The goal of the NCCP/HCP is to fashion a habitat conservation planning and implementation program that addresses coastal sage scrub and other natural habitats on an ecosystem basis at a subregional level, pursuant to the State of California NCCP coastal sage scrub program and within the framework of the 1993 NCCP Conservation Guidelines. According to the NCCP Conservation Guidelines:

> *. . .subregional NCCPs will designate a system of interconnected reserves designed to: 1) promote biodiversity, 2) provide for high likelihoods for persistence of target species in the subregion, and 3) provide for no net loss of habitat value from the present, taking into account management and enhancement. No net loss of habitat value means no net reduction in the ability of the subregion to maintain viable populations of target species over the long-term.*

To achieve the above goals, the NCCP Conservation Guidelines set forth seven tenets of reserve design previously discussed in Section 2.

In other NCCPs, four planning elements comprise the "Conservation Strategy" and have been formulated as programmatic vehicles for carrying out the NCCP Tenets of reserve design:

- *Creation of a Reserve*: the assemblage of large scale Habitat Reserves capable of protecting and maintaining populations of "target species" over the long term.

- *Assurance of Connectivity*: the provision of land areas necessary for the dispersal of target species and the ability to maintain genetic flow within and between areas.

- *Adaptive Management*: the creation of an institutional basis and program for undertaking management actions necessary to sustain populations over the long term, and in doing so, to adapt management actions to new information and changing habitat needs.

- *Implementation Agreement and Funding*: the formulation of a binding Implementation Agreement that identifies the rights and obligations of all signatory parties to the approved NCCP/HCP and provides for funding mechanisms adequate to assure the implementation of the NCCP/HCP consistent with FESA, CESA and the NCCP Act.

The combination of a properly formulated Habitat Reserve and a comprehensive Adaptive Management Program will allow the NCCP/HCP program to maintain *net habitat value* on a *long-term basis* for species ultimately receiving regulatory coverage under the program. As broadly defined in the 1993 NCCP Conservation Guidelines, "no net loss of habitat value means no net reduction in the ability of the subregion to maintain viable populations of target species over the long-term." (Conservation Guidelines, page 9). Specifically defined, *net habitat value*

takes into account habitat gains and losses due to a particular activity, such as reductions in habitat area (impact) and increases in habitat quality (mitigation through restoration and management). The Habitat Reserve and Adaptive Management Program will allow for the mitigation of impacts of proposed incidental take such that the *net habitat value* of the subregion for Identified Species will be maintained on a long-term basis.

The following general policies address the first two planning elements of the conservation strategy for the Southern Subregion NCCP – creation of a Habitat Reserve and assurances of connectivity. Included are policies concerning the urban/wildland interface, fuel management areas, and grazing management designed to be applied throughout the planning area such that the goals of the NCCP/HCP will be met. This planning area guidance is intended to be supplemented by the more specific sub-basin recommendations and policies set forth in Section 5 that are designed to guide protection, management and restoration of habitats and species at the sub-basin scale. With the exception of habitat linkage/corridor recommendations, policies within these topical areas are not generally addressed at the sub-basin scale.

The Adaptive Management component of the three key conservation principles will be provided in a separate document.

3.1 General Policy 1: To maintain *net habitat value* over the long term, site and design new development to conserve and manage *major habitat types* and *major* and *important populations* in *key locations* through the following policies

- Create a Habitat Reserve that includes all *major habitat types* currently existing within the planning area in a manner that conserves blocks of habitat that constitute a diverse representation of the existing range of physical and environmental conditions within the subregion. *Major habitat types* are the generalized natural vegetation communities and include coastal sage scrub, chaparral, grassland, riparian, streamcourses, woodland, forest, lakes and reservoirs, freshwater marsh, vernal pools, and rock & cliff.

- Create a Habitat Reserve that protects habitat supporting listed and selected planning species (see discussion in General Policy 2).

- Create a Habitat Reserve that can be adaptively managed, by a single management entity, as recommended by the State's NCCP Conservation Guidelines and the NCCP Science Advisors. The Southern Subregion NCCP shall either designate or provide for the creation of a management entity capable of overseeing adaptive management of the entire Habitat Reserve.

3.2 General Policy 2: Identify habitat areas necessary for the conservation and management of NCCP/HCP "planning species." Species ultimately selected as Identified Species shall be designated based on the extent to which the Habitat

Reserve provides for the conservation and management of the species consistent with applicable regulatory requirements

- Because the NCCP/HCP addresses a broad range of habitats, the suite of "planning species" has been expanded from the original suite of three NCCP target species: California gnatcatcher, cactus wren and orange-throated whiptail. These planning species, which include both listed and unlisted species, serve as the conservation planning surrogates for identifying habitat areas that should be considered for inclusion in the Habitat Reserve. The planning species selected for the Southern Subregion NCCP are the California gnatcatcher, least Bell's vireo, southwestern willow flycatcher, arroyo toad, Riverside fairy shrimp, San Diego fairy shrimp, thread-leaved brodiaea, cactus wren, tricolored blackbird, yellow-breasted chat, yellow warbler, grasshopper sparrow, white tailed kite, Cooper's hawk, merlin (foraging areas), western spadefoot toad, southwestern pond turtle, San Diego horned lizard, orange-throated whiptail, golden eagle, mountain lion, mule deer, and all California Native Plant Society (CNPS) List 1B and List 2 sensitive species known from the planning area, including many-stemmed dudleya, intermediate mariposa lily, southern tarplant, Coulter's saltbush, chaparral beargrass, saltspring checkerbloom, and mud nama**.** In addition, all historic raptor nest sites will be considered in the reserve design process.

In order to prepare and implement sub-basin guidelines for NCCP/HCP planning species, it is necessary to gain an understanding of each of the species' regional and subregional distribution, specific habitat affinities (including edaphic requirements) and the life history characteristic of each species. In this context, the following issues need to be addressed:

- The species' regional and subregional distribution;
- The relative importance of the Southern Subregion for the continued survival or recovery of the species;
- Key and important habitat characteristics of the species;
- Key and important life history characteristics (e.g., plant pollinators, dispersal, response to fire); and
- Response to management (including enhancement and restoration).

With the above information, *major populations* and *important populations* of the planning species will be identified. *Major populations* are those considered sufficiently large to be self-sustaining with a minimum of active or intensive management intervention or that at least support enough breeding individuals to contribute reliably to the overall metapopulation stability

of the species. *Important populations* may not meet the relative size standards of *major populations*, but may nonetheless be important to the species' long-term survival. For example, a smaller population in a key habitat linkage may be important for breeding success and exchange of genetic material and thus would be considered to be an *important population*, even though it would not be considered a *major population*.

To facilitate reserve design, *key locations* will be defined for some planning species. For planning purposes, *key locations* are those locations that are deemed necessary for the conservation of the species in the subregion. For example, populations of a species that are concentrated in a single or few locations would be *key locations*. *Key locations* may not be identifiable for some species that are widely scattered and lack population concentrations. *Major populations*, or some portion thereof, may be *key locations*, but not all *major populations*, or portions thereof, are necessarily *key locations*.. With respect to *important populations*, most *important populations* would also be in *key locations*. An *important population* may not be a *key location* where, for example, more than one *important population* can fulfill a desired reserve design and species sustainability function (e.g., connectivity). The identification of a *key location* within a *major* or *important population* defines that portion of the population that is necessary for conservation of the species in the subregion. Portions of *major* or *important populations* that are not identified as *key locations* may be impacted consistent with the conservation of the species within the subregion. For listed species with critical habitat identified or proposed within the subregion, the designation or proposed designation for a particular listed species will be reviewed to determine whether the habitat designation should be proposed to be revised and whether special management considerations should be changed or amplified in light of the proposed Southern Subregion NCCP Conservation Strategy. For any listed species for which critical habitat has yet to be designated, habitat essential to the conservation of the species within the subregion and any special management considerations should be identified.

With regard to federally-listed species and other species ultimately designated as Identified Species in the final Southern NCCP/HCP, a main purpose of the final Conservation Strategy is to provide for the protection of those physical and biological features essential to the conservation of Identified Species in a manner consistent with the definitions set forth in FESA Section 3(5)(A)(i) and (ii). As indicated above, the draft Southern NCCP/HCP Guidelines have been formulated to identify *key locations* for listed and other species that are deemed necessary for the conservation of the species in the Subregion. These *key location* determinations, as well as specific connectivity, management and restoration recommendations, are provided for each planning area sub-basin, as well as for the overall planning area. In relation to FESA critical habitat considerations, the Southern NCCP/HCP thus provides the opportunity for a more focused analysis of species protection needs, including a more detailed analysis of special management considerations and habitat protection, consistent with FESA Section 3(5)(A)(i),

than that which can be undertaken on a species-wide critical habitat designation (see discussion in footnote one below).[1]

Accordingly, the EIR/EIS for the Southern NCCP/HCP will evaluate the extent to which the proposed Conservation Strategy (including Habitat Reserve Alternatives) will provide protection for occupied habitat of the gnatcatcher on which are found those physical or biological features essential to the conservation of the species and which may require special management considerations or protection; and unoccupied habitat that is essential for the conservation of the species, consistent with FESA Section 3(5)(A)(i) and (ii). To the extent the recommended final Conservation Strategy differs from the existing and proposed critical habitat designation for the gnatcatcher, USFWS will consider all available information, including information from the final EIR/EIS, in developing the final rule for designating critical habitat for coastal California gnatcatcher. For all other federally listed species found in the Subregion and other Identified Species for which Species Accounts have been finalized pursuant to Sections 3 and 4 of these Guidelines, the EIR/EIS for the Southern NCCP/HCP will evaluate the extent to which the proposed Conservation Strategy (including Habitat Reserve Alternatives) will provide protection for occupied habitat of the species on which are found those physical or biological features essential to the conservation of the species and which may require special management considerations or protection; and unoccupied habitat that is essential for the conservation of the species, consistent with FESA Section 3(5)(A)(i) and (ii).

The subregional guidelines set forth in the following sections should reflect an overall planning area assessment for each of the "planning species" using the above criteria. The geographic application of the subregional guidelines should result in a preliminary reserve design alternative. In turn, the preliminary reserve design should be reviewed from the perspective of the NCCP tenets of reserve design and overall program purposes. The planning area habitats required for the protection of "planning species" serve as the primary indicator of habitats to be considered for inclusion in the Habitat Reserve. The needs of other species considered to be "sensitive species" pursuant to CEQA that are not planning species will be reviewed in conjunction with the reserve design process.

Once a preliminary proposed Habitat Reserve design is identified and a proposed long-term adaptive management program has been formulated, species proposed for regulatory coverage will be designated as proposed "Identified Species." The basis for regulatory coverage for each "Identified Species" will be derived from applicable state and federal regulatory requirements.

[1] "The HCP development process provides an opportunity for more intensive data collection and analyses regarding the use of particular habitat areas by the gnatcatcher. The process also enables us to conduct detailed evaluations of the importance of such lands to the long-term survival of the species in the context of constructing a biologically configured system of interlinked habitat blocks. We will provide technical assistance and work closely with applicants throughout the development of future HCPs to identify lands essential for the long-term conservation of the gnatcatcher and appropriate management for those lands. By definition, if the gnatcatcher is a covered species under future HCPs, the plans should provide for the long-term conservation of the species." (Fed.Reg. Vol. 65, No. 206, 10/24/00, 63693)

3.3 General Policy 3: Assure wildlife and habitat connectivity within the subregion and to other subregions. Site and design new development to assure wildlife and habitat connectivity between *major* and *important populations* in *key locations*, within the subregion and between those populations and *major populations* in other contiguous subregions

The planning area is partially urbanized and partially open space. In urbanized areas, there are varying opportunities for wildlife movement, ranging from highly constrained settings such as Mission Viejo where wildlife movement may be restricted to a man-made culvert, to more expansive areas, such as the Arroyo Trabuco, that afford "live-in habitat" for some species while conveying movement between surrounding development for a broader suite of species. Areas presently in open space generally facilitate wildlife movement in multiple directions and provide "live-in habitat" for many species, but can show constrained movement (e.g., along narrow vectors) where the open space is contiguous with already urbanized areas. The identification of the most important movement wildlife corridors and habitat linkages, as defined below, which will continue to support effective movement in a future environment that supports development depends on animal behavior, habitat affinities and local geography.

For broad wildlife movement areas that presently allow for unconstrained movement, future development scenarios will restrict movement patterns to some extent. To weigh the merits of alternative development configurations/reserve designs, there is a need to preliminarily identify wildlife movement opportunities that are likely important to retain for ecosystem function. Identification of the areas most important for retaining effective wildlife movement in a future environment with development requires consideration of available wildlife movement data, existing species distributions, habitat affinities, animal behavior and local geography. To provide guidance for the planning process, these factors were considered to identify the areas discussed below that are considered important for maintaining wildlife movement functions under any reserve alternative.

To the extent feasible, important broad wildlife movement areas will be retained in the Habitat Reserve. Where conservation of an entire wildlife movement area within the Habitat Reserve is not feasible, a reduced or more constrained habitat linkage or wildlife corridor would still be conserved and managed. In addition, the function of habitat linkages will be conserved and managed to facilitate wildlife movement in multiple directions. The linkages will be managed to provide "live-in" habitat for a variety of species such that the overall function of the wildlife movement area is maintained.

In order to provide guidance for the planning process, important areas for maintaining wildlife movement functions under any reserve designs are described in this subsection. For purposes of General Policy 3, a distinction is drawn between habitat linkages and wildlife corridors:

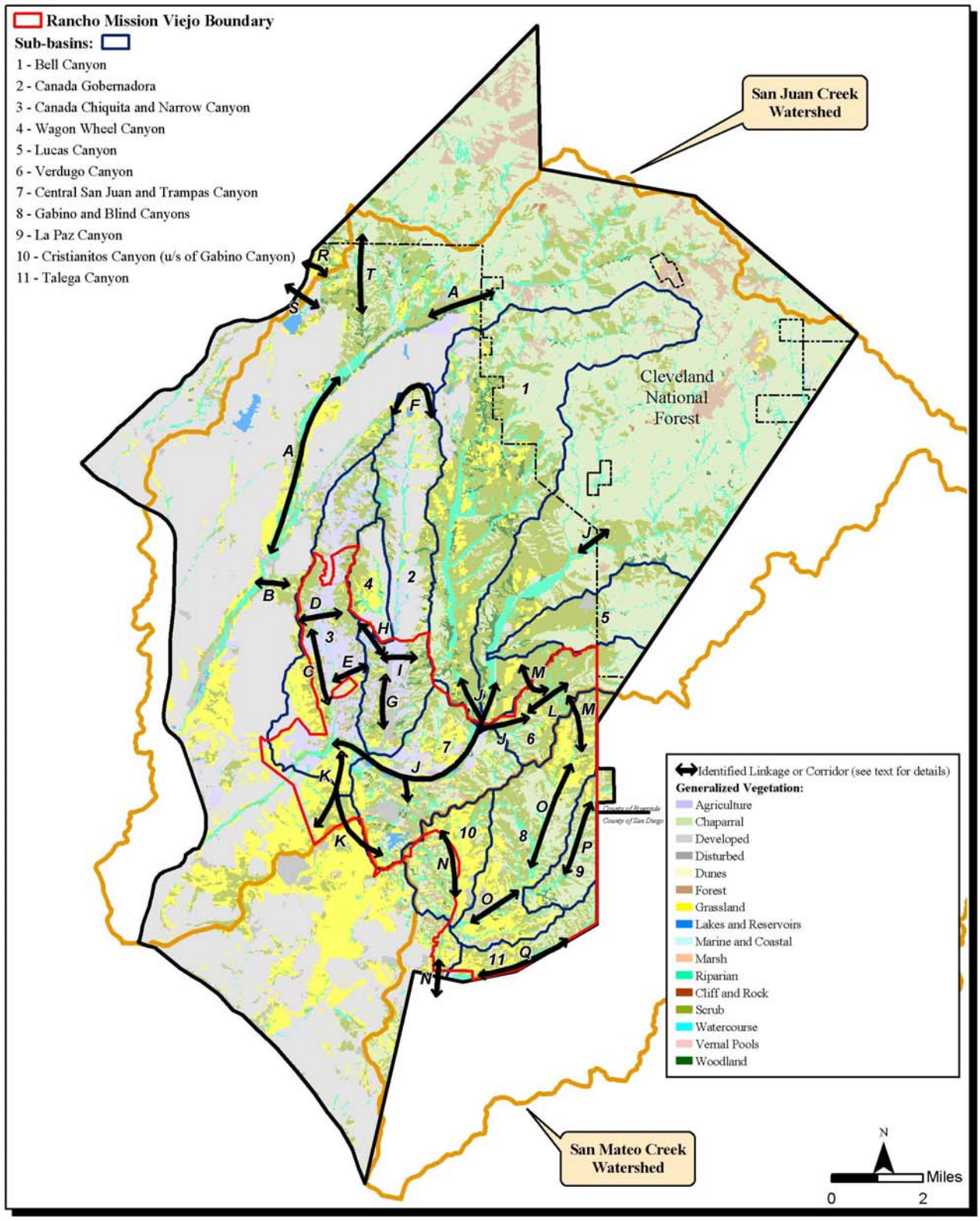
- *Habitat linkages*: Following Soule and Terborgh's (1999) use of the term "landscape linkage," habitat linkages are areas of natural habitat that function to join two larger blocks of habitat. They serve as connections between habitat blocks and help reduce the adverse effects of habitat fragmentation by providing a potential route for gene flow and long-term dispersal. Habitat linkages may serve both as "live-in" habitat and avenues of gene flow for small animals such as reptiles, amphibians, and rodents. Habitat linkages also provide for the transit of larger species, but as contrasted with wildlife corridors, as defined below, also may be "live-in" habitat for larger species (i.e., support breeding sites, frequent use areas, etc.). Habitat linkages also may be represented by continuous habitat or by closely spaced habitat "islands" that function as stepping stones for dispersal and movement (especially for birds and flying insects).

- *Wildlife corridors*: As defined here, wildlife corridors tend to be linear features that connect large blocks of habitat and provide avenues for frequent movement, dispersal or migration of larger animals. Because of their more narrow configuration wildlife corridors generally serve a more limited function than habitat linkages and primarily are used for transit of larger species rather than as live-in habitat for a broader suite of species. Wildlife corridors may also contain "choke-points" (e.g., hourglass or funnel shapes) or man-made structures such as culverts and flood control channels that wildlife quickly move through.

Habitat linkages and wildlife corridors facilitate the dispersal by smaller, less mobile species and frequent movement (e.g., daily, weekly, etc.) by large mammal species such as mountain lion, mule deer, coyote and bobcat. The species identified below only highlight a much broader suite of species served by the habitat linkages and corridors. Accordingly, the species identified should not be interpreted as the only species that benefit from the linkages and corridors. It can be reasonably assumed that habitat linkages and corridors that function for large mammals (except coyote) also function for many other species.

Except where only habitat linkages or corridors currently exist, the following discussion identifies habitat linkage and corridor functions within the general wildlife movement areas that appear to be important to be retained under any reserve alternative. Identification of these linkage and corridor functions are based on field studies of wildlife movement in the planning area (e.g., Beier and Barrett 1993, DUDEK 1995; MBA 1996; Padley 1992), input from the Science Advisors and the wildlife agencies, and the consultant team's review and analysis of the species, vegetation, and physiographic information for the subregion. Habitat linkages and wildlife corridors in the planning area are shown in Figure 3-1 and include:

- The Arroyo Trabuco (A) between about Avery Parkway and the Cleveland National Forest provides a habitat linkage for movement and dispersal of large species, as well as for numerous smaller, less mobile species (e.g., Beier and Barrett 1993; DUDEK 1995; Padley 1992; Science Advisors 1997).



Draft NCCP/HCP Planning Guidelines

Habitat Linkages and Wildlife Corridors Map

FIGURE 3-1

- The area (B) between the Las Flores and Ladera Ranch developments connecting Arroyo Trabuco and Chiquita Ridge provides an existing habitat linkage for species such as California gnatcatcher and a wildlife corridor for large mammals (e.g., Beier and Barrett 1993).

- The combined Chiquita Ridge and Creek area (C) provides a north-south wildlife habitat linkage from San Juan Creek to the "horseshoe" of habitat surrounding the northern end of Coto de Caza. This linkage is important for species such as California gnatcatcher and cactus wren and also for movement and dispersal of large mammals (e.g., Beier and Barrett 1993; DUDEK 1995; MBA 1996; Padley 1992; Science Advisors 1997).

- The "Narrows" area (D) separating middle and lower Chiquita Canyon consists of oak/riparian and coastal sage scrub habitats, and relatively little dry land farming. This area provides an east-west habitat linkage between Chiquita Ridge and Chiquadora Ridge and Sulphur Canyon for both large mammals and small, mobile species such as the gnatcatcher (e.g., Beier and Barrett 1993; MBA 1996; Padley 1992).

- A mosaic of coastal sage scrub and grassland in lower Chiquita Canyon (E), such as the area adjacent to the wastewater treatment plant, provides an east-west movement corridor for California gnatcatcher dispersal, as well as for dispersal and movement of large mammals.

- The "horseshoe" connection (F) north of Coto de Caza provides a "stepping-stone" habitat linkage for the California gnatcatcher and cactus wren. It probably has limited existing function as a wildlife corridor for large species, although coyotes likely move through the area and bobcat and mule deer may occasionally use the corridor.

- Chiquadora Ridge and adjacent Gobernadora Creek (G) provide a north-south habitat linkage for California gnatcatcher and cactus wren to San Juan Creek, as well for movement and dispersal by large mammals (e.g., Beier and Barrett 1993; MBA 1996; Padley 1992; Science Advisors 1997).

- Sulphur Canyon (H) provides a north-south and east-west habitat linkage for large mammals between Chiquita Canyon and Wagon Wheel Canyon and Canada Gobernadora that allows wildlife to move east to Bell Canyon and Caspers Wilderness Park. It also provides a north-south connection for smaller species such as California gnatcatcher and cactus wren (e.g., Beier and Barrett 1993; MBA 1996; Padley 1992; Science Advisors 1997).

- Canada Gobernadora between Coto de Caza and the mouth of Sulphur Canyon (I) provides an east-west habitat linkage for large mammals between Chiquita Canyon and Wagon Wheel Canyon to the west and Bell Canyon and Caspers Wilderness Park to the east (e.g., Beier and Barrett 1993; MBA 1996).

- San Juan Creek (J) functions as a central nexus for north-south and east-west wildlife movement in the central part of the planning area. It connects Chiquita Ridge and Chiquita Canyon with the Central San Juan Creek and Trampas Canyon sub-basin to allow dispersal and movement to the south via Cristianitos Canyon. It also serves east-west wildlife movement and dispersal from Chiquita Canyon upstream to the Cleveland National Forest and major tributaries such as Canada Gobernadora, Bell Canyon, and Verdugo Canyon (e.g., Beier and Barrett 1993; DUDEK 1995; Padley 1992; Science Advisors 1997). It should be noted that under existing conditions, large wildlife species (coyote, mule deer, bobcat and possibly mountain lion) moving between San Juan Creek and Trampas Canyon and the Radio Tower Road area either use existing corrugated steel and concrete box culverts under Ortega Highway (DUDEK 1995) or must cross the highway directly.

- Habitat west of the silica mine in Trampas Canyon (K) currently provides dispersal opportunities for California gnatcatchers and other species between Chiquita Ridge and gnatcatcher populations in San Juan Capistrano and San Clemente, as well as eastward dispersal between Trampas Canyon and the Talega development to the RMV Conservancy, Cristianitos Canyon and MCB Camp Pendleton.

- Verdugo Canyon (L) provides an east-west habitat linkage for large mammals between San Juan Creek and the Cleveland National Forest (Beier and Barrett 1993; Padley 1992).

- Upland coastal sage scrub and chaparral habitats adjacent to Verdugo Canyon (M) may provide north-south movement opportunities for the cactus wren and other species, although it is likely that these species also disperse along San Juan Creek.

- Local gnatcatcher populations in the Southeast Quadrant are relatively small, compared with the remainder of the planning area, and are concentrated along the Cristianitos Creek corridor and overlooking lower Talega Creek. Although there is the potential for gnatcatcher dispersal through coastal sage scrub patches throughout the Southeast Quadrant, an important habitat linkage for gnatcatchers within the Southeast Quadrant appears to be Cristianitos Canyon (N), which links San Juan Creek with local populations in lower Gabino Creek and Camp Pendleton along lower Cristianitos/San Mateo Creek.

- Gabino Canyon (O) provides a north-south habitat linkage between the planning area and the Cleveland National Forest for large mammals (Beier and Barrett 1993; MBA 1996; Padley 1992; Science Advisors 1997) and may support dispersal by the cactus wren and other species.

- La Paz Canyon (P) provides a north-south habitat linkage between the planning area and the Cleveland National Forest for large mammals (Beier and Barrett 1993; Padley 1992) and possibly a habitat linkage for dispersal by the cactus wren and other species.

- Talega Canyon (Q) provides for east-west and north-south movement between the planning area and MCB Camp Pendleton for large mammals (Beier and Barrett 1993; Padley 1992), cactus wren and other species.

- The Saddleback Meadows (R) area provides a lower elevation habitat linkage between the Southern Subregion planning area and the Central Subarea component of the Central and Coastal Subregion NCCP/HCP Habitat Reserve. This area also provides a very limited wildlife corridor between the Central and Southern subregions via two 300-ft long corrugated steel pipes that cross under El Toro Road (DUDEK 1995). This crossing may be used by smaller animals such as coyote, gray fox and raccoons, but likely is not used by bobcat, mule deer or mountain lion because the pipes are long and confining, and preclude visual contact between the two ends because they have a slight bend.

- The area north of Oso Reservoir (S), including O'Neill Regional Park and the nursery provides a lower elevation "stepping stone" habitat linkage between the Southern Subregion planning area and the Central Subarea component of the Central and Coastal Subregion NCCP/HCP Habitat Reserve. With habitat restoration, this linkage likely would be suitable for the California gnatcatcher.

- The Foothill-Trabuco Specific Plan (1985) identified the locations of several habitat linkages and wildlife corridors, generally shown as (T), within the upper Arroyo Trabuco area. The precise locations of extant linkages and corridors needs to be refined and based on information developed through the review of existing developments and recently submitted specific project plans.

3.4 General Policy 4: Roads and infrastructure should be located outside the Habitat Reserve to the maximum extent feasible. The siting and design of roads and infrastructure should provide for protection of habitat linkages and movement corridors.

- To the maximum extent feasible, roads and infrastructure should be located outside the Habitat Reserve.

- Roads that are necessary to serve approved land and water uses located inside or outside the Habitat Reserve shall be designed and sited to minimize impacts on designated Identified Species, to accommodate wildlife movement to the maximum extent feasible, and to minimize impacts to habitat and associated species. Where roads are necessary, under the approved NCCP/HCP, they will be designed consistent with safety, roadway design criteria that are appropriate for the setting and desired roadway function. Roadway design shall include bridges and/or culverts large enough to accommodate fish and wildlife movement and, where appropriate and feasible, wildlife over crossings. In addition, bridges and culverts should maintain appropriate sediment movement for existing streams. As appropriate, fencing, grading and plant cover will be provided to

serve wildlife crossings consistent with conservation principles and the adaptive management program. Where feasible and safe, lighting along roadways within the Habitat Reserve should be avoided. Where roadway lighting within the Habitat Reserve is necessary for public safety reasons, it should be low-sodium or similar low intensity lighting that is directed away or shielded from the Habitat Reserve.

- Other infrastructure facilities (e.g., pipelines, transmission lines, etc.) that are necessary to serve approved uses or regional needs also shall be sited and designed to accommodate wildlife movement and, to the extent feasible, to minimize impacts to habitats and designated Identified Species located inside and outside the Habitat Reserve. To the extent feasible, infrastructure facilities within the Habitat Reserve should be located within or immediately adjacent to existing roadways or other developed landscapes.

3.5 General Policy 5: Long-term indirect impacts to the Habitat Reserve and other areas being preserved for species protection shall be managed through creation of an urban/wildlands interface zone separating the Habitat Reserve and the non-reserve/urban areas. Management within the interface zone would:

- Create fuel management zones combining irrigated and non-irrigated native plantings separating the Habitat Reserve from adjacent urban uses.

- To the extent that fuel management zones are composed of native habitats and can support Identified Species and other species, or be enhanced or managed to support Identified Species and other species, this should be encouraged. For example, using prickly-pear in the fuel management zone may provide habitat for the cactus wren, as well as enhance the buffering effect between the Habitat Reserve and developed areas.

- Fuel management zones and practices will be set forth in a "fuel management plan" as part of the NCCP/HCP and aquatic resources protection program.

- Prohibit plants identified by the California Exotic Pest Plant Council as an invasive risk in Southern California from development and fuel management zones adjoining the Habitat Reserve;

- Manage pesticide and herbicide use and fertilizer application techniques in landscaped areas, including golf courses, located adjacent to the Habitat Reserve or preserved wetlands and provide comprehensive water quality treatment, which may include, but not be limited to, the use of natural treatment systems, prior to discharge of urban runoff into the Habitat Reserve;

- Shield and/or direct lighting away from habitat areas through the use of low-sodium or similar intensity lights, light shields, native shrubs, berms, and other shielding methods; and

- Provide barriers, fencing, signs, walls, etc. to manage and direct access by the public and domestic animals (e.g., pets) to protect sensitive habitat and species.

3.6 General Policy 6: Cattle grazing shall be permitted within the Rancho Mission Viejo portion of the Habitat Reserve provided that grazing activities are consistent with a "grazing management plan" approved as part of the certified NCCP/HCP

- The grazing management plan (GMP) approved as part of the NCCP/HCP shall identify suitable grazing areas and allowable grazing practices that are consistent with certified NCCP/HCP policies and the aquatic resource management program. The GMP will address grazing practices following approval of the NCCP/HCP and prior to transfer of lands to the Habitat Reserve.

- The GMP will incorporate grazing management techniques designed to address the needs of species and habitat identified for protection, promote perennial grasses including native grasses, allow for continued cattle grazing sufficient to support cattle operations and, where appropriate, reduce fuel loads for fire.

SECTION 4: SPECIES ACCOUNTS FOR LISTED AND SELECTED PLANNING SPECIES

This section provides species accounts and key habitat components for listed and other selected "planning species" in the planning area, as identified in Section 3. The "planning species" are intended to serve as conservation planning surrogates for identifying habitat areas that should be considered for inclusion in the Habitat Reserve.

The following species accounts are a "work in progress" for the purpose of characterizing, analyzing and developing the conservation and management strategy for listed and other selected "planning species." As a "work in progress" the first version of this document provides species accounts for the seven listed species that occur in the Southern Subregion planning area – California gnatcatcher, arroyo toad, least Bell's vireo, southwestern willow flycatcher, San Diego fairy shrimp, Riverside fairy shrimp and thread-leaved brodiaea. It also provides accounts for several unlisted plan species: many-stemmed dudleya, intermediate mariposa lily, southern tarplant, Coulter's saltbush and mud nama. These accounts represent the current status of the species accounts prepared and reviewed by the NCCP/HCP working group. Other unlisted planning species, as identified in Section 3, will be added to this document as those accounts are completed.

The accounts include both regional and subregional background information for the species as the basis for developing specific protection, management and restoration recommendations that can be applied at the watershed and sub-basin levels. Both the regional and subregional perspective are important because the relative importance of populations of planning species at the subregional, watershed and sub-basin level can only be understood within the broader context. Developing protection, management, and restoration recommendations for the planning species requires an understanding of each species' regional and subregional distribution, as well as the specific habitat affinities and key life history characteristic of each species. In this context, the following issues need to be addressed:

- The species' regional and subregional distribution;
- The relative importance of the Southern Subregion for the continued existence or recovery of listed species or sustainability of unlisted species;
- Existing regional or subregional protection of species, to the extent known;
- Key and important habitat characteristics of the species;
- Key and important life history characteristics (e.g., pollinators, dispersal mechanisms, response to fire); and

- Response of the species to management (e.g., directed or selective grazing, prescribed burns, exotics control/eradication, translocation, seed propagation).

Using the above information, *major populations* and *important populations* of the planning species are identified. *Major populations* are those considered sufficiently large to be self-sustaining with a minimum of active or intensive management intervention or that at least support enough breeding individuals to contribute reliably to the overall metapopulation stability of the species. *Important populations* may not meet the relative size standards of *major populations*, but may nonetheless be important to the species' long-term survival. For example, a smaller population in a key habitat linkage may be important for breeding success and exchange of genetic material and thus would be considered to be an *important population*, even though it would not be considered a *major population*.

To facilitate reserve design, *key locations* will be defined for some planning species. For planning purposes, *key locations* are those locations that are deemed necessary for the conservation of the species in the subregion. For example, populations of a species that are concentrated in a single or few locations would be *key locations*. *Key locations* may not be identifiable for some species that are widely scattered and lack population concentrations. *Major populations*, or some portion thereof, may be *key locations*, but not all *major populations*, or portions thereof, are necessarily *key locations*. With respect to *important populations*, most *important populations* would also be in *key locations*. An *important population* may not be a *key location* where, for example, more than one *important population* can fulfill a desired reserve design and species sustainability function (e.g., connectivity). The identification of a *key location* within a *major* or *important population* defines that portion of the population that is necessary for conservation of the species in the subregion. Portions of *major* or *important populations* that are not identified as *key locations* may be impacted consistent with the conservation of the species in the subregion. For listed species with critical habitat identified or proposed within the subregion the designation or proposed designation for a particular listed species will be reviewed to determine whether the habitat designation should be proposed to be revised and whether special management considerations should be changed or amplified in light of the proposed Southern Subregion NCCP Conservation Strategy. For any listed species for which critical habitat has yet to be designated, habitat essential to the conservation of the species within the subregion and any special management considerations should be identified.

With regard to federally-listed species and other species ultimately designated as Identified Species in the final Southern NCCP/HCP, a main purpose of the final Conservation Strategy is to provide for the protection of those physical and biological features essential to the conservation of Identified Species in a manner consistent with the definitions set forth in FESA Section 3(5)(A)(i) and (ii). As indicated above, the draft Southern NCCP/HCP Guidelines have been formulated to identify *key locations* for listed and other species that are deemed necessary for the conservation of the species in the Subregion. These *key location* determinations, as well as specific connectivity, management and restoration recommendations, are provided for each planning area sub-basin, as well as for the overall planning area. In relation to FESA critical

habitat considerations, the Southern NCCP/HCP thus provides the opportunity for a more focused analysis of species protection needs, including a more detailed analysis of special management considerations and habitat protection, consistent with FESA Section 3(5)(A)(i), than that which can be undertaken on a species-wide critical habitat designation (see discussion in footnote one below).[1]

Accordingly, the EIR/EIS for the Southern NCCP/HCP will evaluate the extent to which the proposed Conservation Strategy (including Habitat Reserve Alternatives) will provide protection for occupied habitat of the gnatcatcher on which are found those physical or biological features essential to the conservation of the species and which may require special management considerations or protection; and unoccupied habitat that is essential for the conservation of the species, consistent with FESA Section 3(5)(A)(i) and (ii). To the extent the recommended final Conservation Strategy differs from the existing and proposed critical habitat designation for the gnatcatcher, USFWS will consider all available information, including information from the final EIR/EIS, in developing the final rule for designating critical habitat for coastal California gnatcatcher. For all other federally listed species found in the Subregion and other Identified Species for which Species Accounts have been finalized pursuant to Sections 3 and 4 of these Guidelines, the EIR/EIS for the Southern NCCP/HCP will evaluate the extent to which the proposed Conservation Strategy (including Habitat Reserve Alternatives) will provide protection for occupied habitat of the species on which are found those physical or biological features essential to the conservation of the species and which may require special management considerations or protection; and unoccupied habitat that is essential for the conservation of the species, consistent with FESA Section 3(5)(A)(i) and (ii).

Specific buffer recommendations and requirements are not included in the species accounts. Requirements, guidelines or recommendations for buffers of specific widths for some species have been incorporated into Biological Opinions or appear in listings of threatened and endangered species, critical habitat designations and the scientific literature. However, these buffer widths are variable, because appropriate buffer widths depend on a variety of factors, including adjacent habitat, adjacent existing and future land uses, topography, and potential or existing threats. Such variable factors are better addressed on a site-specific rather than a generic basis (i.e., one size does not fit all). In the following species accounts, information about suitable adjacent habitats, where relevant, is provided in the accounts to help guide planning for appropriate buffers.

[1] "The HCP development process provides an opportunity for more intensive data collection and analyses regarding the use of particular habitat areas by the gnatcatcher. The process also enables us to conduct detailed evaluations of the importance of such lands to the long-term survival of the species in the context of constructing a biologically configured system of interlinked habitat blocks. We will provide technical assistance and work closely with applicants throughout the development of future HCPs to identify lands essential for the long-term conservation of the gnatcatcher and appropriate management for those lands. By definition, if the gnatcatcher is a covered species under future HCPs, the plans should provide for the long-term conservation of the species." (Fed.Reg. Vol. 65, No. 206, 10/24/00, 63693)

4.1 Listed Species

4.1.1 California Gnatcatcher

Polioptila californica – California Gnatcatcher
Federal: Threatened
State: Species of Special Concern

a. Regional Status

Historically, the California gnatcatcher ranged from southern Ventura County southward through Los Angeles, Orange, Riverside, San Bernardino, and San Diego counties, and into Baja California, Mexico, to approximately 30 degrees North latitude near El Rosario (Atwood 1990). The gnatcatcher was considered locally common in the mid-1940s; but by the 1960s, this subspecies had declined substantially in the United States owing to widespread destruction of its habitat (Atwood 1990). Currently, the subspecies occurs on coastal slopes of southern California, ranging from southern Ventura southward through Palos Verdes Peninsula in Los Angeles County through Orange, Riverside, San Bernardino and San Diego Counties into Baja California to El Rosario, Mexico, at about 30 degrees North latitude (Atwood 1991).

Gnatcatcher sites listed in Table 4-1 include cumulative observed locations of gnatcatchers dating from about 1989 to 2001. The sites may include breeding pairs or some unpaired individuals. Because gnatcatcher breeding populations fluctuate from year to year, these data are not intended to provide an accurate population estimate, but include gnatcatcher observations recorded since about 1989 to provide a relative measure of gnatcatcher distribution and densities within southern California for the purpose of conservation planning.

TABLE 4-1
REGION-WIDE SUMMARY:
2001 STATUS OF COASTAL CALIFORNIA GNATCATCHER SITES
WITHIN KNOWN RANGE OF SOUTHERN CALIFORNIA

Regional Population Area(s)	Number of Counted Gnatcatcher Sites[1,2]
San Diego MSCP	1,819[3]
North San Diego County MHCP	378[4]
Central/Coastal NCCP Reserve	340[5]
Central/Coastal Special Linkage, NRPPA, Existing Use Area and Non-Reserve Open Spaces	140[6]

TABLE 4-1 (*Continued*)

Regional Population Area(s)	Number of Counted Gnatcatcher Sites[1,2]
Protected Gnatcatcher Sites in Southern Orange County Subregion NCCP (Conservation Easements)	348[7]
Unprotected Sites in the Southern Subregion NCCP	389[7]
Palos Verde Peninsula, Los Angeles County	38[8]
APPROXIMATE TOTAL SITES IN NCCP/HCP PLANNING AREAS	***3,452 sites***
Gnatcatcher Sites Located on Federal Lands	
MCB, Camp Pendleton	620
Miramar MCAS	53
TOTAL GNATCATCHER SITES ON FEDERAL LANDS	***673 sites***
Gnatcatchers Within Areas Not Covered by 4(d) Rule Protections but Subject to Section 9 ESA Protections	
Riverside County	326[9]
Los Angeles County	97
San Bernardino County	27
Ventura County	12[10]
TOTAL GNATCATCHER SITES SUBJECT TO SECTION 9	***461 sites***
GNATCATCHER SITES IN NCCP/HCP PLANNING AREAS, FEDERAL LANDS OR SUBJECT TO SECTION 9 PROTECTIONS	
Gnatcatchers Sites in NCCP Planning Areas	3,445
Gnatcatchers Sites on Federal Lands	673
Gnatcatcher Sites Subject to Section 9 Protections	454
GNATCATCHER SITES NOT AUTHORIZED FOR TAKE	***4,579***
GNATCATCHER SITES AUTHORIZED FOR TAKE BY APPROVED NCCP'S	**1,103**
GRAND TOTAL	**5,682**

Notes:

1 Gnatcatcher sites include cumulative observed locations of gnatcatchers dating from 1989 to 2001. The sites may include breeding or unpaired individuals. These data are intended to provide information about observed occupied habitat.

2 Non- footnoted numbers are taken from the 1999 USFWS Biological Opinion for the Gnatcatcher 4(d) rule.

3 San Diego Multiple Species Conservation Plan, Table 3-5, page 3-45, August 1996.

4 Source is Dr. Wayne Spencer, Conservation Biology Institute, 2001.

5 Central and coastal Subregion NCCP/HCP, Table 1-ES, July 17, 1996.

6 Central and coastal Subregion NCCP/HCP with updated survey data by Harmsworth Associates for the North Ranch Policy Plan Area, 2001.

7 Source is Dr. Philip Behrends, Dudek & Associates, Inc., 2001.

8 Atwood et al., 1997

9 Source is Western Riverside County Multi-Species Habitat Conservation Program sensitive species data base, 2001.

10 Source is Susan Davison, EDAW, 2003.

The California gnatcatcher, is a small, long-tailed member of the thrush family (Muscicapidae). The gnatcatcher typically occurs in or near sage scrub habitat, which is a broad category of vegetation that includes the following plant communities as classified by Holland (1986): Venturan coastal sage scrub, Diegan coastal sage scrub, maritime succulent scrub, Riversidean sage scrub, Riversidean alluvial fan sage scrub, southern coastal bluff scrub, and coastal sage-chaparral scrub. Coastal sage scrub is composed of relatively low-growing, dry-season deciduous, and succulent plants. Characteristic plants of this community include coastal sagebrush (*Artemisia californica*), various species of sage (*Salvia* sp.), California buckwheat (*Eriogonum fasciculatum*), lemonadeberry (*Rhus integrifolia*), California encelia (*Encelia californica*), and *Opuntia* spp. Ninety-nine percent of all gnatcatcher locality records within coastal Orange and San Diego counties occur at or below an elevation of 300 meters (m) (984 feet [ft]) (Atwood 1990).

Gnatcatchers also use chaparral, grassland, and riparian habitats where they occur adjacent to sage scrub. The use of these habitats appears to be most frequent during late summer, autumn, and winter, with smaller numbers of birds using such areas during the breeding season. These non-sage scrub habitats are used for dispersal (see discussion below), but data on dispersal use are largely anecdotal (Bowler 1995; Campbell et al. 1998). Although existing quantitative data are poor regarding gnatcatcher use of these other habitats, these areas may be critical during certain times of year for dispersal or as foraging areas during drought conditions. Breeding territories have also been documented in non-sage scrub habitat. Campbell et al. (1998) discuss likely scenarios explaining why non-coastal sage scrub is used by gnatcatchers, including food source availability, dispersal areas for juveniles, temperature extremes, fire avoidance, and lowered predation rate for fledglings.

The California gnatcatcher is primarily insectivorous, non-migratory, and exhibits strong site tenacity (Atwood 1990). The diet of gnatcatchers, based on fecal analyses, includes leaf- and plant hoppers and spiders as dominant prey, with true bugs, wasps, bees, and ants as only minor components of their diet (Burger et al. 1999).

The breeding season of the gnatcatcher extends from mid February through middle August, with the peak of the nesting activity occurring from mid-March through mid-May. The gnatcatcher nest is a small, cup-shaped basket usually found one to three feet above the ground in a small shrub or cactus. Clutch sizes range between three and five eggs, with the average being four. Juvenile birds associate with parents for several weeks (sometimes months) after fledging (Atwood 1990). The coastal California gnatcatcher is a year-round resident. Post-breeding dispersal of fledglings occurs between late May and late November.

Two studies have documented dispersal by California gnatcatchers. Mean dispersal of juveniles in Orange County was found to be 1.05 kilometer (km) (0.65 mile [mi]) with one individual dispersing a total of 7.5 km (4.7 mi) (Galvin 1998). In an isolated population on the Palos Verdes Peninsula, the mean dispersal distance of gnatcatchers banded as nestlings for males was 2.8 km (1.7 mi) and for females was 3.3 km (2.0 mi) (Atwood et al. 1996). Although the mean dispersal distances that have been documented above are relatively low, dispersal of juveniles is

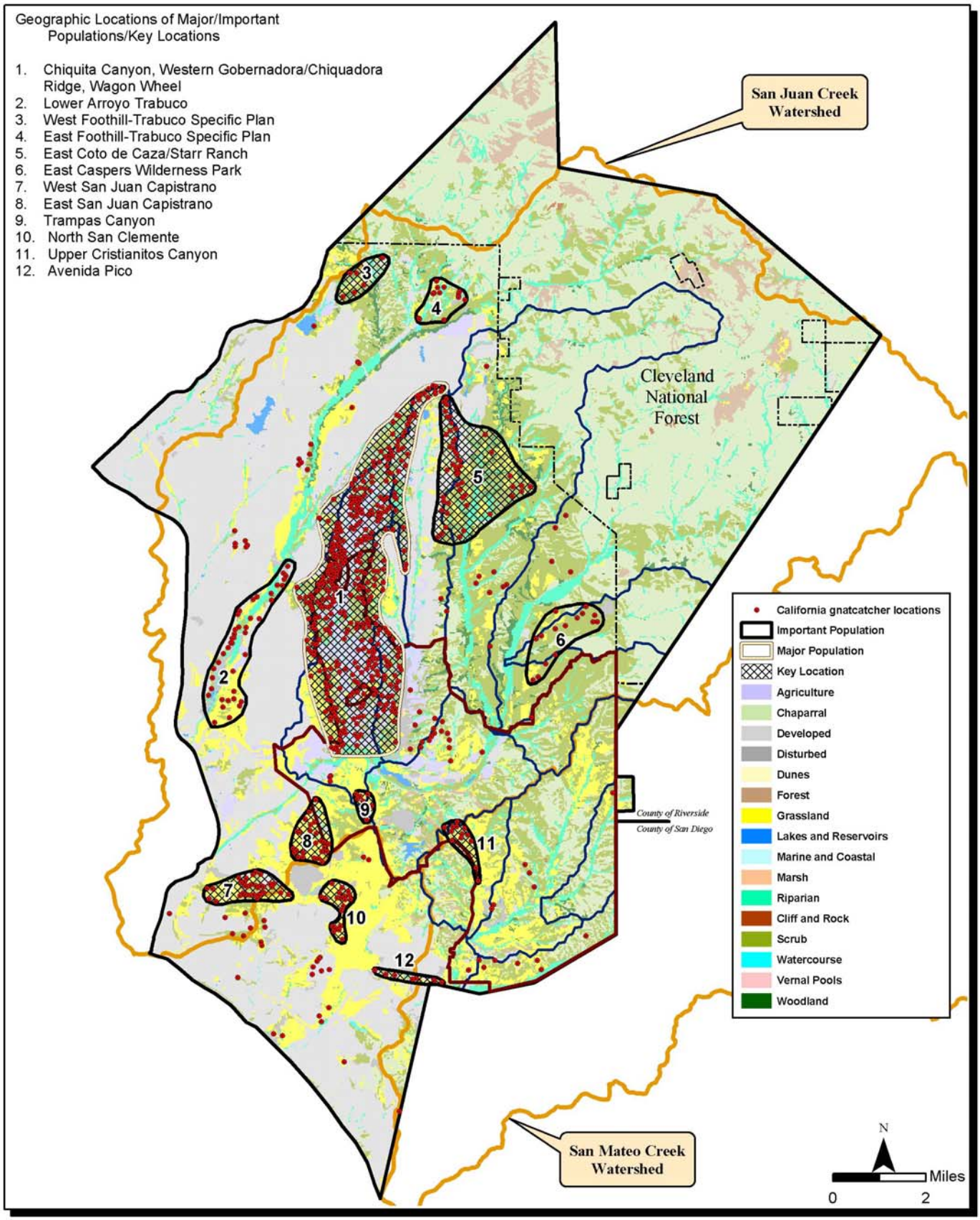
difficult to observe and to document without extensive banding studies. It is likely that the few current studies underestimate the gnatcatcher's typical dispersal capacity because of the difficulty of detecting (Bailey and Mock 1998). Juvenile coastal California gnatcatchers are apparently able to traverse highly man-modified landscapes, including non-native landscaping vegetation, for at least short distances (Bailey and Mock 1998). Additionally, natural and restored coastal sage scrub habitat along highway corridors has been documented to be used for foraging and nesting by gnatcatchers and may serve important dispersal functions (Famolaro and Newman 1998).

Coastal sage scrub is patchily distributed throughout the range of the gnatcatcher, and the gnatcatcher is not uniformly distributed within the structurally and floristically variable coastal sage scrub community. Rather, the subspecies tends to occur most frequently within the coastal sagebrush-dominated stands on mesas, gently sloping areas, and along the lower slopes of the coast ranges (Atwood 1990). Territory size increases as vegetation density decreases and with distance from the coast, probably due to food resource availability. Therefore, gnatcatchers will use sparsely vegetated coastal sage scrub for shelter and to forage for insects as long as perennial shrubs are available.

b. Subregional Status

The 737 mapped locations for the California gnatcatcher in the Southern Subregion are distributed throughout the subregion, with population concentrations at the lower elevations. About 97 percent of the 737 mapped locations are at elevations below 366 m (1,200 ft) (Figure 4-1). The locations above 366 m are concentrated in the Foothill-Trabuco Specific Plan area and the eastern portion of Caspers Wilderness Park. Table 4-2 provides a breakdown of mapped gnatcatcher locations by watershed and sub-basin. As illustrated in the Table 4-2, the vast majority of gnatcatcher locations are in the San Juan Creek Watershed. The San Clemente Hydrological Unit includes about 7 percent of the locations and the portion of the San Mateo Creek Watershed in the planning area supports only 4 percent of the locations.

Gnatcatcher concentrations in the planning area also can be described in terms of relatively discrete local populations that lend themselves to an analysis of *major* and *important populations* and *key locations*. Generally these local populations are comprised of clusters of locations that probably encompass typical dispersal patterns within the local area. For example, the Chiquita population exhibits a clearly defined cluster of points, although the break between this population and the cluster on the ridge between Coto de Caza and Bell Canyon is somewhat arbitrary. On the other hand, the population east of Coto clearly is less concentrated even though there are substantial patches of coastal sage scrub available. Although empirical data for dispersal in the subregion are not available, based on dispersal studies conducted elsewhere (e.g., Galvin 1998; Baily and Mock 1998), it can be hypothesized where birds may move within the planning area. For example, Galvin's (1998) study of dispersal by gnatcatchers in southern Orange County found that most dispersal movements by juvenile gnatcatchers were less than 1 km (3,275 ft), although birds are capable of moving much farther (e.g., Baily and Mock 1998).



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California Gnatcatcher Distribution Map

FIGURE 4-1

TABLE 4-2
CALIFORNIA GNATCATCHER DISTRIBUTION
IN THE SOUTHERN SUBREGION

	No. Mapped Locations	Percent of Total
Sub-basins in San Juan Creek Watershed		
Chiquita Canyon	282	38%
Canada Gobernadora	109	15%
Central San Juan & Trampas Canyon	17	2%
Wagon Wheel Canyon	23	3%
Bell Canyon	29	4%
Lucas Canyon	10	1%
Verdugo Canyon	1	<1%
Other Sub-basins within Watershed	185	25%
SUBTOTAL	**654**	**89%**
Sub-basins in San Mateo Creek Watershed		
Cristianitos Canyon	12	2%
Gabino & Blind Canyons	4	<1%
La Paz Canyon	1	<1%
Talega Canyon	7	1%
Other Sub-basins within Watershed	5	<1%
SUBTOTAL	**31**	**4%**
San Clemente Hydrological Unit	**52**	**7%**
Total	***737***	***11%***

The Southern Subregion supports one *major population* centered in the Chiquita Canyon area, including Chiquadora Ridge and Wagon Wheel Canyon. This *major population* includes approximately 404 locations, or about 55 percent of the total locations in the subregion. This population also is a *key location* because it is central to several other *important populations* that are distributed throughout the subregion, as well as populations to the south on Camp Pendleton. Some of these *important populations* may only number a few mapped locations, but occur in areas important for geographic diversity and representation of the gnatcatcher in the subregion. *Important populations* that are also identified as *key locations* are integral to the overall function of the reserve for this species because they provide linkages to other populations, including populations on Camp Pendleton.

Table 4-3 summarizes the identified *major* and *important populations* and *key locations* for the California gnatcatcher in the Southern Subregion. These populations and locations are depicted in Figure 4-1. Table 4-3 is followed by a narrative summary of these populations and locations.

TABLE 4-3
MAJOR AND IMPORTANT POPULATIONS OF THE
CALIFORNIA GNATCATCHER IN THE SOUTHERN SUBREGION

Population No.	Population Type/ Location	General Area	No. Locations
1	Major/Key Location	Chiquita Canyon, Western Gobernadora/ Chiquadora Ridge, Wagon Wheel	404
2	Important	Lower Arroyo Trabuco	41
3	Important/Key Location	West Foothill-Trabuco SP	6
4	Important	East Foothill-Trabuco SP	14
5	Important/Key Location	East Coto de Caza/Starr Ranch	52
6	Important	East Caspers Wilderness Park	15
7	Important/Key Location	West San Juan Capistrano	35
8	Important/Key Location	East San Juan Capistrano	28
9	Important/Key Location	Trampas Canyon	7
10	Important/Key Location	North San Clemente	21
11	Important/Key Location	Upper Cristianitos Canyon	13
12	Important/Key Location	Avenida Pico	8
Total Locations in Major and Important Population Areas			**644 (87%)**
Total Locations not included in Major or Important Population Areas			**93 (13%)**

- The Chiquita Canyon area (No. 1 on Figure 4-1), including Chiquadora Ridge and Wagon Wheel Canyon supports a *major population*, both within the Southern Subregion, and within the range of the gnatcatcher in southern California. This area, which extends from the "horseshoe" in northern Coto de Caza south to San Juan Creek, includes 404 mapped locations of the gnatcatcher and accounts for 55 percent of the gnatcatchers in the subregion. As the *major population* in the subregion, this population also is in a *key location*.

- Lower Arroyo Trabuco (No. 2 on Figure 4-1) between about Avery Parkway and Oso Parkway supports an *important population* containing about 41 mapped locations. This population is linked to the Chiquita Canyon population through the open space habitat on Chiquita Ridge between the Las Flores and Ladera Ranch developments. This population is considered important because it contains a substantial number of gnatcatchers, provides dispersal areas and potentially a refugium for birds in Chiquita Canyon when wildfires occur. Although this area supports an *important population*, it is not considered a *key location* and a minor loss of locations would still be consistent with the species conservation goals.

- The portion of the Foothill-Trabuco Specific Plan area west of the Live Oak Canyon Road (No. 3 on Figure 4-1) supports an *important population* in a *key location*. Although there are only about six gnatcatcher locations here, the area is important as a low elevation habitat link to gnatcatcher populations in the Central Subregion.

- The portion of the Foothill-Trabuco Specific Plan in the Rose Canyon area (No. 4 on Figure 4-1) supports an *important population* of the gnatcatcher. Although the gnatcatcher is sparsely distributed and there are only 14 mapped locations for this area, it represents the upper elevation limit and edge of the geographic range for the species in the Southern Subregion. This population contributes to the physiographic diversity of the species in the subregion. Birds in this population probably also disperse to the *important population* west of Live Oak Canyon Road and possibly to the *major* and *important populations* to the south.

- The population of gnatcatchers along the ridgeline between the Gobernadora and Bell Canyon sub-basins, and the scattered locations east of the northern Bell Canyon (No. 5 on Figure 4-1) comprise an *important population* in a *key location.* This population is physically linked to the Chiquita Canyon *major population* via the "horseshoe" north of Coto de Caza, but does not exhibit quite as high a concentration of birds despite the predominance of coastal sage scrub in the area. This population is considered important because it contains 52 gnatcatcher locations, provides dispersal areas and potentially refugia for birds in Chiquita Canyon when wildfires occur. It is also considered to be in a *key location* because it provides a north-south linkage to other gnatcatcher locations in Caspers Wilderness Park, including scattered locations west of San Juan Creek and *important population* No. 6 (Figure 4-1) located east of San Juan Creek.

- The population east of San Juan Creek in Caspers Wilderness Park (No. 6 of Figure 4-1) is an *important population.* This population comprising 15 locations represents the eastmost extension of the gnatcatcher in the subregion and thus provides physiographic diversity for the species in the subregion.

- The population located north of Camino Las Ramblas in San Juan Capistrano (No. 7 on Figure 4-1) is an *important population* in a *key location.* This area supports about 35 mapped locations and is the southwesternmost cluster of gnatcatchers in the subregion. This population contributes to the physiographic diversity of the species in the subregion and provides potential refugia in case of wildfire in locations to the east.

- The population generally located north of Camino Las Ramblas and west of La Pata Avenue in San Juan Capistrano (No. 8 on Figure 4-1) is an *important population* in a *key location.* This population numbers about 28 locations and is in a *key location* for the north-south linkage between the Chiquita Canyon *major population*, the *important population* to the west (No. 7) and the *important population* to the south (No. 10).

- The population generally located northwest of the silica sand mining operation in Trampas Canyon (No. 9 on Figure 4-1) is an *important population* in a *key location.* Although this area supports only about seven locations, it contributes to the north-south linkage between Chiquita Canyon and the San Juan Capistrano populations and also provides a potential east-west linkage between the San Juan Capistrano and Chiquita Canyon populations and the upper Cristianitos population.

- The population of about 21 locations located mostly in San Clemente west of the proposed extension of La Pata Avenue and on either side of the proposed extension of Camino Del Rio (No. 10 on Figure 4-1) is an *important population* in a *key location.* This population provides a low elevation east-west linkage between the San Juan Capistrano populations (Nos. 7 and 8) and the *important population* along Avenida Pico (No. 12), that then connects to the population along lower Cristianitos and San Mateo creeks and other populations on Camp Pendleton.

- The population in upper Cristianitos Canyon (No. 11 on Figure 4-1) is an *important population* in a *key location.* While this is a small populations with only 13 mapped locations, it is located in a *key location* for connecting the Chiquita Canyon *major population* with populations in lower Cristianitos and San Mateo creeks on Camp Pendleton. It is the eastmost of the low elevation population connections.

- The population located south of Avenida Pico in San Clemente (No. 12 on Figure 4-1) is an *important population* in a *key location.* Although this area supports only eight locations, it is in a *key location* for the east-west linkage between populations in San Juan Capistrano and San Clemente and the population in lower Cristianitos and San Mateo creeks on Camp Pendleton. It is the only remaining southerly link for these populations.

c. Protection Recommendations

- Based on the application of the protection recommendations for overall biological resources in the Chiquita sub-basin, the goal is to protect at least 80 percent of the existing coastal sage scrub and gnatcatcher locations within the *major population* (including those sites within the Chiquita sub-basin and the Chiquadora Ridge portion of the Gobernadora sub-basin). Additional conservation of gnatcatcher habitat will be achieved by implementation of the restoration recommendations described below.

- Avoid impacts to the *important population* of the California gnatcatcher and coastal sage scrub in the portion of the Chiquita sub-basin south of San Juan Creek, as well as the locations west of Narrow Creek within the *major population* to the maximum extent feasible to maintain resident and dispersal habitat for the gnatcatcher between Chiquita Ridge and San Juan Capistrano and San Clemente.

- Protect the major north-south habitat connection for the California gnatcatcher to Central San Juan Creek by providing a habitat linkage between Chiquita Creek and the eastern edge of the Ladera Open Space.

- Maintain east-west biological connectivity for habitat linkages for the gnatcatcher between Arroyo Trabuco, Chiquita Canyon and Canada Gobernadora. Biological connectivity should be maintained between Chiquita, Gobernadora and Arroyo Trabuco by providing for connectivity at a minimum of three locations within the sub-basin: (1) via rim to rim preservation of Sulphur Canyon (approximately 2,000 to 2,500 feet wide), (2) at the "Narrows" where the canyon is only 210-244 m (700-800 ft wide) (approximately 900 m [3,000 ft] south of Tesoro High School) and connects to Sulphur Canyon; and (3) in contiguous patches of coastal sage scrub through the major canyon north and east of the wastewater treatment plant.

- Maintain connectivity between protected coastal sage scrub patches throughout Chiquadora Ridge to allow for dispersal of gnatcatchers between patches.

- Maintain a continuous upland habitat linkage for gnatcatchers along the east-facing slopes of Chiquadora Ridge between San Juan Creek and Sulphur Canyon.

- Provide floodplain and upland habitat linkages adjacent to San Juan Creek for east-west and north-south dispersal by the California gnatcatcher between the Chiquita Canyon and Cristianitos sub-basins.

- Avoid impacts to the *important populations* of California gnatcatchers and coastal sage scrub to the maximum extent feasible to maintain resident and dispersal habitat for the gnatcatcher between San Juan Creek and Cristianitos Canyon and populations on Camp Pendleton.

- Maintain upland north-south habitat linkages through the central and western portions of the Trampas Canyon subunit to convey gnatcatchers between San Juan Creek and Cristianitos Canyon, the Donna O'Neill Conservancy at Rancho Mission Viejo and other areas of the San Mateo Watershed.

- Within the Trampas Canyon subunit of the Central San Juan Creek and Trampas Canyon sub-basin, maintain upland east-west habitat linkage for gnatcatchers south of the artificial lake to link Prima Deshecha, Talega Open Space and other habitat to the west with the Donna O'Neill Conservancy and the San Mateo Watershed. This habitat linkage should allow for dispersal of gnatcatchers and other avian species, as well as provide a movement corridor for large mammals such as bobcat, coyote and mule deer.

- Maintain a north-south habitat linkage between San Juan Creek and lower San Mateo Creek for dispersal and movement of gnatcatchers and other avian species, as well as

large mammals such as bobcat, coyote and mule deer, and, in particular, avoid occupied coastal sage scrub habitat in upper Cristianitos Canyon.

d. Management Recommendations

- Implement a cowbird trapping program to mitigate for impacts to existing habitat within the sub-basin and for potential impacts associated with future development. The cowbird trapping program will be evaluated on an annual basis and trap locations and trapping effort will be adjusted as part of the overall adaptive management program (e.g., if the number of trapped cowbirds drops to a prescribed threshold, the trapping program may be terminated or otherwise modified).

e. Restoration Recommendations

- Implement a coastal sage scrub (CSS)/valley needlegrass grassland (VGL) restoration program to enhance habitat connectivity and mitigate for impacts to existing habitat associated with future development. Identified restoration areas include Chiquita Ridge, Chiquadora Ridge and Sulphur Canyon.

4.1.2 Arroyo Toad

Bufo californicus - Arroyo Toad
Federal: Endangered
State: Species of Special Concern

a. Regional Status

The arroyo toad originally ranged from the upper Salinas River system in Monterey County, south through the Santa Ynez, Santa Clara and Los Angeles river basins and the coastal drainages of Orange, Riverside and San Diego counties in the U.S. and south to the Arroyo San Simeon system about 16 km (10 mi) southeast of San Quintin, Baja California, Mexico (USFWS 1999). Although the arroyo toad primarily occurs in coastal drainages, it also is known from desert slopes of the Transverse and Peninsular ranges south of the Santa Clara River in Los Angeles County (USFWS 1999). Population areas along the desert slope include the Mojave River in San Bernardino County and Little Rock Creek, Whitewater River, San Felipe Creek, Vallecito Creek, and Pinto Canyon in Riverside County (Jennings and Hayes 1994; Patton and Myers 1992; Stebbins 1985). As of 1994, only 22 discrete populations were thought to exist in California over an area representing about 25 percent of the historic range of the species. The final recovery plan for the arroyo toad divided the existing range into three units: the northern, southern and desert units (USFWS 1999). The drainages within these units generally describe the existing distribution of the toad and are listed below.

Northern Unit

San Antonio River, Monterey County
Sisquoc River and tributaries, Santa Barbara County
Upper Santa Ynez River Basin (Indian, Mono, Agua Caliente), Santa Barbara County
Sespe Creek, Ventura County
Piru Creek (Upper and Lower), Ventura and Los Angeles counties
Upper Santa Clara River Basin, Los Angeles County
Upper Los Angeles Basin (Big Tujunga, tributaries, Arroyo Seco), Los Angeles County

Southern Unit

Santiago Creek, Orange County
San Jacinto River and Bautista Creek, Riverside County
San Juan basin and Trabuco Creeks, Orange and Riverside counties
San Mateo and San Onofre Creek basins, San Diego and Orange counties
Lower Santa Margarita basin (De Luz, Roblar, and Sandia creeks), San Diego County
Upper Santa Margarita basin (Temecula Creek, Arroyo Seco), Riverside and San Diego counties
Lower and Middle San Luis Rey basin (below Lake Henshaw), San Diego County
Upper San Luis Rey basin (above Lake Henshaw), San Diego County
Santa Ysabel Creek, San Diego County
San Diego Basin (including San Vicente Creek), San Diego County
Sweetwater River basin (including Viejas, Petersen creeks), San Diego County
Cottonwood Creek basin, San Diego County

Desert Unit

Little Rock Creek, Los Angeles County
Upper Mojave River basin (Mojave, Deep, Horsethief, Little Horsethief), San Bernardino County
Whitewater River basin, Riverside County

Arroyo toads are found in foothill canyons and inter-mountain valleys where rivers are bordered by low hills and the stream gradients are low (Miller and Miller 1936; Sweet 1992). The arroyo toad uses riparian environments for breeding and adjacent uplands for foraging and estivation. Arroyo toads are known to either breed, forage, and/or aestivate in aquatic habitats, riparian, coastal sage scrub, oak, and chaparral habitats. The species is restricted to medium- to large-sized, slow-moving streams. The majority of arroyo toad population studies occur within third and fourth order drainages that are characterized by decomposed granite bedrock. However, toad populations have been found in a wide range of stream orders, including lower, second order, and higher, fifth and sixth order coastal streams characterized by sedimentary rock (PCR 2002). According to USFWS, streams supporting arroyo toads range from first to sixth order in the central part of the species' range (Orange, Riverside and San Diego counties) (USFWS 1999).

Natural geomorphological processes are important for maintaining suitable breeding habitat for the arroyo toad. Periodic flooding is required to modify the stream channel, limit the proliferation of vegetation within the channel and the adjacent upland terrace, redistribute coarse sediments within the streamcourse, and redistribute breeding pools (USFWS 2001). The flooding regime is directly responsible for the development of the appropriate number and size of breeding pools, friable soils for juvenile and adult toads to create burrows, and unvegetated lower stream terraces (Jennings and Hayes 1994; USFWS 1999).

Breeding pools must be open and shallow with minimal current, and a sand or pea gravel substrate overlain with sand or flocculent silt (Sweet 1989). Breeding sites generally have flow rates less than 5 cm per second (cm/sec) (USFWS, 1999). Currents greater than 5 cm/sec are sufficient to displace eggs and embryos up to 82 hours post hatching (Sweet 1992). Stream bottoms composed of sand or well-sorted gravel are favored by adults for breeding (USFWS 2001). Larval growth appears to be more rapid in pools with low silt loads (Jennings and Hayes 1994). Griffin et al. (1999) found that fine-, medium-, and coarse-grained sands are the preferred adult burrow substrate and that cobble is the least preferred, although burrow sites can be interspersed with heavier gravel and cobble.

Water persistence in natal pools is key to successful breeding by arroyo toads. Streams must have persistent water from March to mid-June in shallow, gravely pools less than 7.1 cm (18 in) deep and adjacent sandy terraces. The larval period of arroyo toads lasts about 65-85 days, so the persistence of water is crucial for successful breeding and high mortality of tadpoles can occur if breeding pools dry up too quickly.

Adjacent banks must provide open, sandy or gravely terraces with very little herbaceous cover for adult and juvenile foraging areas, within a moderate riparian canopy of cottonwood, willow, or oak. Heavily shaded pools are unsuitable for larvae and juvenile toads due to lower water and soil temperatures and poor algal mat development (Sweet 1992). Juveniles favor areas that remain damp, have midday surface temperatures of 34 to 37 degrees Celsius (C) (93.2-98.6 degrees Fahrenheit [F]) and contain less than 10 percent cover, because these sites possess the thermal and refuge characteristics required for juvenile survival and rapid growth (Sweet 1992).

Several studies have examined the instream activity of arroyo toads during the breeding season. Studies summarized by the USFWS (2001) indicate that subadults and male adults can move anywhere from 0.8 km (0.5 mi) to more than 1 km (0.6 mi) along streamcourses during a single breeding season. In upper Piru Creek it was inferred that toads had moved as far as 8 km (5 mi) along a streambed, based on the consistent absence of toads from this area in previous surveys.

There also is some information of lateral movements from streams into uplands during the breeding season. The USFWS states that "Although the upland habitat use patterns of this species are poorly understood, activity probably is concentrated in the alluvial flats (areas created when sediments from the stream are deposited) and sandy terraces found in valley bottoms of

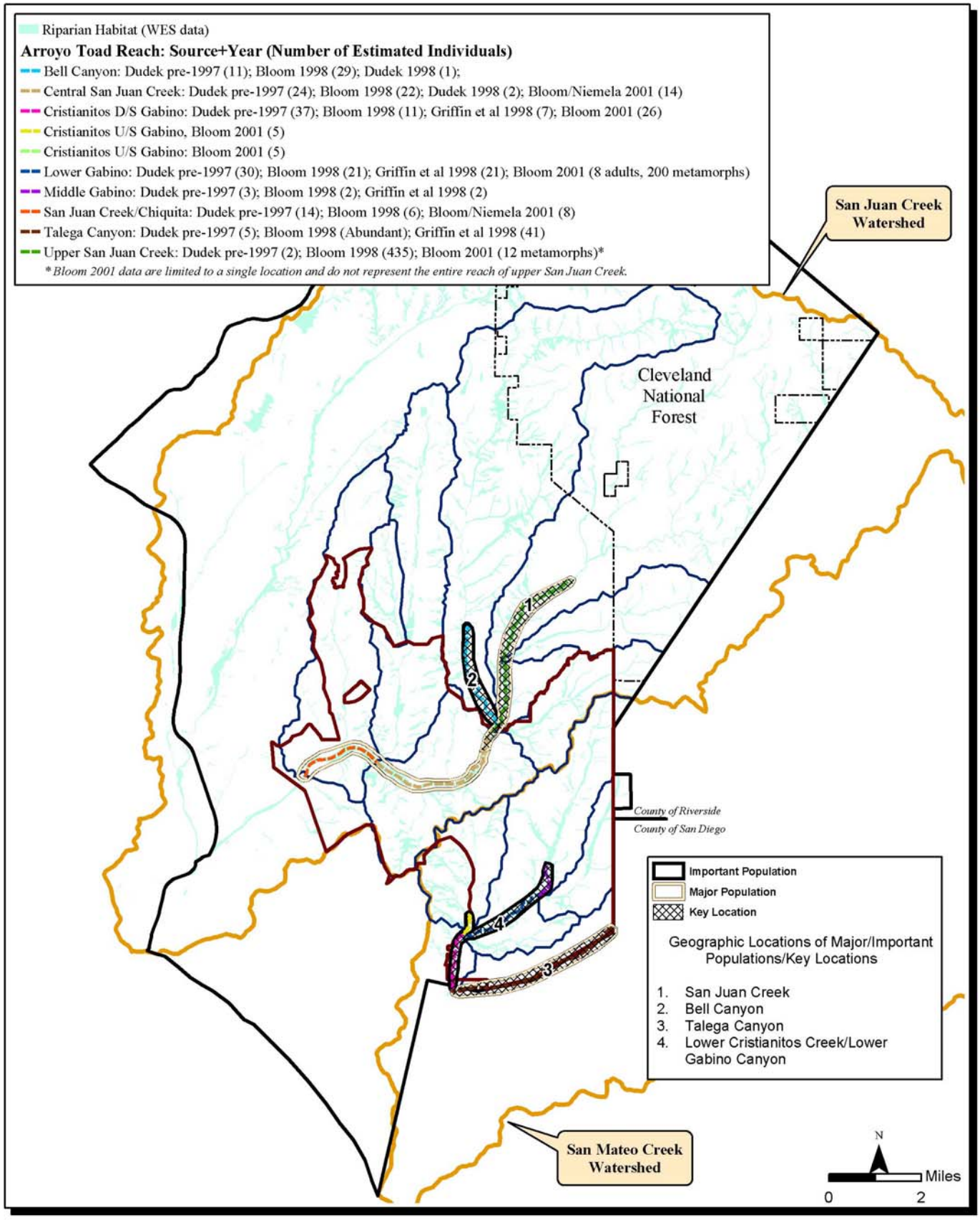
currently active drainages." (Federal Register, 9415, 2/07/01). Upland habitat use appears to be related to rainfall amounts, availability of surface water, width of streamside terraces and floodplains, vegetative cover and topography (USFWS 2001). For example, Griffin et al. (1999) found that lateral movements were related to topography adjacent to the stream. In coastal streams with broad floodplains, 33 males moved an average maximum of 92 m (302 ft) from the stream, while in a narrower canyon 13 males moved only 23 m (75 ft) from the streambed. Ramirez (2000) observed a similar pattern where 12 toads in a very narrow floodplain on a desert slope moved a maximum distance of 37 m (121 ft) and an undisclosed number of toads moved a maximum of 200 m (656 ft) in a broader floodplain. Griffin et al. (1999) noted that tall cliff faces may hinder toad movements into upland habitats, with a female struggling on a 60 degree sandstone slope along a cliff edge.

While there seems to be a general relationship between lateral movement and topography, the USFWS (2001) concluded that there are not enough data "to characterize fully overwintering activities and habitat use in all of the systems that arroyo toads inhabit." However, they did conclude that, "Individual toads have been observed as far as 2 km (1.2 mi) from streams where they breed, but are found most commonly within 0.5 km (0.3 mi) of those streams (Service 1999; Griffin et al. 1999; Dan C. Holland, Camp Pendleton Amphibian and Reptile Survey, Fallbrook, California, unpublished data; Holland and Sisk 2000)." (Federal Register, 9415-9416, 2/7/01)

b. Subregional Status

Within the Southern Subregion planning area the arroyo toad is associated with riparian, streamcourses with sandy benches along streams in both the San Juan Creek and San Mateo Creek watersheds (Figure 4-2). Different survey efforts over the past several years in association with the FTC-South project and other projects consistently have found toads in the San Juan Creek Watershed from about the mouth of Chiquita Canyon upstream to about Hot Springs Creek and in lower Bell Canyon. In the San Mateo Watershed in the planning area the toad occurs in Talega, lower Gabino and lower Cristianitos creeks. In addition, the USFWS (2001) cited a personal communication from D. Holland that a population of the arroyo toad also occurs in upper Arroyo Trabuco, but the population size and specific location has not been confirmed (e.g., it does not appear in the 2002 CNDDB).

In 1998 Bloom conducted a study area-wide survey to assess the status of the toad, although his survey in Arroyo Trabuco only extended as far north as Oso Parkway. Since 1998, additional studies have been conducted on the arroyo toad in relation to the FTC-South project (Bloom 2000; Bloom and Niemela 2001) and an independent radio-telemetry study by Griffin et al. 1999). Because these studies were conducted in different years under different environmental conditions, the absolute number of toads detected within the same reaches of drainages are variable, but relatively consistent among different drainages; i.e., areas with a small number of detections had consistently fewer detections across survey years than areas where larger numbers of toads were detected.



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Arroyo Toad Distribution Map

FIGURE 4-2

The planning area supports two *major populations* and two *important populations.* The two *major populations* are located in San Juan Creek from near the confluence with Chiquita Canyon north to beyond the confluence with Hot Springs Creek and in Talega Creek from the confluence with Cristianitos Creek to at least the eastern boundary of the planning area. The two *important populations* are located in Bell Canyon from the confluence with San Juan Creek north to about 3.5 km (2.2 mi) north of the confluence; and lower Cristianitos/lower Gabino Canyon extending from the confluence of Cristianitos and Talega creeks to about 3,000 feet upstream of the confluence of Gabino and La Paz creeks (i.e., into middle Gabino) and in Cristianitos Creek extending about 2,500 feet upstream of Gabino Creek.

The San Juan Creek and Bell Canyon populations probably comprise distinct, but linked populations. The San Juan Creek and Bell Canyon populations are linked because the streamcourses are directly connected by suitable habitat, allowing toads to move freely between the two areas. However, the two sub-basins are physically distinct; the Bell Canyon sub-basin is a much smaller sub-watershed and characterized by a narrower canyon. It is likely that peak flows and timing for the two sub-basins are different, thus affecting the character of toad breeding habitat.

Likewise, the Talega, Cristianitos and Gabino canyons populations probably are distinct, but linked local populations. Like Bell Canyon and San Juan Creek, they are all connected by suitable habitat within the drainages. However, these sub-basins are characterized by different geological structures and processes that likely affect the quality of toad breeding habitat. For example, as summarized in the *Baseline Conditions and Hydrologic Conditions* report (PCR/BALANCE/PWA 2002), Talega Canyon has the highest proportion of poorer infiltrating soils of any of the other sub-basins in the San Mateo Watershed, while Gabino Canyon has a higher infiltration capacity that other sub-basins in the watershed. Although Talega has a high runoff volume, it also has a relatively low magnitude of peak flows because of the elongated shape of the sub-basin and long routing distance of the streamcourse. In contrast, Gabino has the highest peak flows and runoff volume because of its high drainage density, position high in the watershed and steep terrain. Sediment from Gabino also contains a high proportion of cobbles and other larger particles that are less suitable for toad breeding habitat. Cristianitos is a relatively small sub-basin and has the lowest absolute runoff volume and peak flows of the sub-basins studied in the watershed. The clays in the sub-basin contribute to fine sediments discharged to the creek, which generally are an unsuitable substrate for toad breeding habitat.

An additional reason that the populations in these sub-basins should be considered linked, but distinct is that fires within the sub-basins would be expected to have different effects on the populations; e.g., a fire in the Talega sub-basin may result in temporary disruption or loss of the Talega population. In such a case the Cristianitos and Gabino populations would be important source populations for recolonization of the Talega sub-basin.

Whether the San Juan Creek and San Mateo Creek populations are linked is unknown. The minimum distance between occupied toad habitat in the San Juan and San Mateo watersheds

populations is about 3.7 km (2.3 mi). Based on the observation of toads moving as far as 1.9 km (1.2 mi) from streams, it is conceivable that toads occasionally could move between the two watersheds.

Major and *important populations* were identified and are illustrated in Figure 4-2. Each of the population areas is described in detail below:

- The *major population* in San Juan Creek (No. 1 on Figure 4-2) extends from near the confluence with Chiquita Canyon north to about 0.8 km (0.5 mi) south of Hot Springs Creek in the Cleveland National Forest. (Note: Bloom [1998] mapped potential habitat to an area about 915 m (3,000 ft) downstream of Antonio Parkway bridge, but toads have not been observed this far west.) While this population can be considered continuous because toads have been observed throughout the area, the reach of San Juan Creek extending north from near the confluence with Bell Canyon supports the large majority of the toad population in San Juan Creek and provides the highest quality habitat for the species in the creek. This reach supported about 435 counted adult toads in 1998 (Bloom 1998) and is the second largest population area in the subregion. Habitat for the toad approximately 800 feet below the confluence with Bell Canyon becomes degraded by a proliferation of arundo and the open stream channel becomes obscured by riparian vegetation by about 1,600 feet below Bell Canyon. This demarcation is consistent with Bloom's observation of 29 toads in this reach in 1998, compared to fewer toads downstream. Because it supports a large population and high quality habitat, the portion of the *major population* in "upper" San Juan Creek from about 1,600 feet south of Bell Canyon can be considered a *key location*.

  Surveys in San Juan Creek downstream of Bell Canyon on RMV property have yielded persistent, but relatively small, population counts. In the segment from near the mouth of Gobernadora Creek to about 2,000 feet south of Bell Canyon, counts were 24 individuals before 1997, 22 individuals in 1998 by Bloom and 14 individuals in 2001 by Bloom and Niemela. In the more downstream portion of this segment between Gobernadora and Chiquita, pre-1997 counts were 14 individuals, 6 by Bloom in 1998 and 8 by Bloom and Niemela in 2001. The consistent small numbers of individuals in this reach of San Juan Creek distinguish it from the *key location* of this *major population* upstream from the point about 1,600 feet south of Bell Canyon. Recent breeding in this lower reach has been limited to the area just downstream of Trampas Canyon and is maintained by artificial runoff from Trampas. The reason for fewer toad detections and apparent decline in breeding south of the confluence with Bell Canyon in recent years is not completely known, but likely is the result of a combination of natural and anthropogenic factors, including an inferred natural groundwater barrier between Chiquita and Gobernadora canyons and San Juan Creek that limits inter-aquifer exchange, groundwater withdrawals, truck traffic, other human activity, and bullfrogs in the abandoned mining pit. In contrast, upper San Juan Creek probably is naturally wetter, allowing for longer persistence of breeding pools, and is subject to fewer human uses. In addition, arundo is

proliferating in the reach below Bell Canyon, resulting in degradation of toad habitat. For recovery purposes, active management to maintain breeding pools and control arundo in the stream likely will be needed to sustain this segment of the population on a long-term basis.

- The *important population* in Bell Canyon (No. 2 on Figure 4-2) extends from the confluence with San Juan Creek north about 2.2 miles up Bell Creek into Caspers Wilderness Park. In 1998 Bloom counted 29 calling males in this area. This *important population* is considered a *key location* because it is situated in a relatively undisturbed area and is directly connected to the San Juan Creek *major population*.

- The *major population* in Talega Canyon (No. 3 on Figure 4-2) was categorized as "abundant" by Bloom in 1998, with an estimated 1,000+ calling toads. In the same study year, however, Griffin et al. (1999) counted only 41 calling toads in the same reach, but comparisons can be difficult because of the high nightly variation in suitability for toad activity (e.g., moonlight, air temperature, winds, etc.). Based on the Bloom survey, Talega Creek is assumed to support the largest population in the subregion and is in a *key location*. In addition, this population is connected to the downstream arroyo toad populations in lower Cristianitos and San Mateo creeks on Camp Pendleton, as well as the upstream populations in Cristianitos and lower Gabino creeks. In addition to suitable geomorphic conditions for the toad discussed above, the combination of higher precipitation in the upper watershed and presence of year-round springs provides a more reliable water source to support breeding pools.

- The *important population* in lower Cristianitos Creek and lower Gabino Creek (No. 4 on Figure 4-2) extends from the confluence of Cristianitos and Talega creeks upstream into Gabino Creek to about 3,000 feet north of the confluence with La Paz Creek and in Cristianitos Creek about 2,500 feet upstream of Gabino Creek.

  Over several surveys in the segment of Cristianitos Creek between its confluence with Gabino Creek in the north and Talega Creek in the south, calling males have numbered 37 before 1997, 11 by Bloom in 1998, 7 by Griffin et al. in 1998 and 26 by Bloom in 2001. The segment of lower Gabino from the confluence with Cristianitos to La Paz Creek numbered 30 before 1997, 21 by Bloom in 1998, 21 by Griffin et al. in 1998, and 8 by Bloom in 2001 (as well as 200 metamorphs observed during this survey). The portion of the *important population* within lower Gabino and lower Cristianitos creeks is considered a *key location* because it is linked along the streamcourse to the *major population* in Talega Canyon.

  The segment of Cristianitos Creek upstream of the confluence with Gabino Creek is included as part of the *important population* because it is directly connected to the populations in lower Gabino Creek and Cristianitos Creek downstream of Gabino. However, this portion of the *important population* is not considered a *key location*. This

reach is considered marginal breeding habitat for arroyo toads because of the clayey sediments that are characteristic of this portion of the creek. Out of three survey years, only in 2001 were toads (5 adults) recorded along this stream segment and they were observed only adjacent to the creek. There was no evidence that toads were breeding in the creek.

c. Protection Recommendations

- Maintain and manage riparian and aquatic habitats along San Juan Creek for breeding populations of the arroyo toad.

- Provide upland foraging and estivation habitat within the upland terraces in the floodplain of San Juan Creek, with a particular focus on the south side of the creek, to maintain existing population levels of the arroyo toad.

- Maintain Verdugo Canyon hydrology to maintain sources of coarse sediment that are important for arroyo toad breeding habitat in downstream areas.

- Protect breeding and foraging habitat and movement opportunities within the lower Gabino Canyon, lower Cristianitos and Talega Canyon streamcourses and adjacent alluvial terraces for the arroyo toad. Address potential upland estivation habitat needs in the context of best scientific information regarding the influence of topography, soils and other factors that appear to influence arroyo toad lateral movement and frequency of use in upland areas away from streamcourse habitat areas.

- Protect the integrity of arroyo toad populations in Talega Canyon by maintaining current stormwater runoff patterns and hydrologic conditions.

- Protect the arroyo toad population within middle Gabino Creek upstream from the confluence with La Paz Creek by avoiding impacts to breeding, foraging and estivation habitat and protect canyons to avoid downstream impacts to the toad.

- Protect the integrity of arroyo toad populations in lower Gabino Creek, as well as downstream populations in Cristianitos and San Mateo creeks, by protecting the generation and transport of coarse sediments in La Paz Creek to downstream areas.

- Protect the *key location* of the arroyo toad upstream from the confluence of Cristianitos and Talega creeks by avoiding direct impacts to breeding, foraging and estivating habitat and avoiding indirect impacts to the Cristianitos and lower Gabino sub-basins.

d. Management Recommendations

- Within the Gobernadora, Verdugo, Cristianitos, Gabino, and La Paz sub-basins, protect the integrity of downstream habitat for the arroyo toad by maintaining hydrology, water quality and sediment delivery to San Juan and San Mateo creeks, including flow characteristics of episodic events, and minimizing additional loadings of nutrients or toxics.

- Maintain stormwater flow characteristics comparable to existing conditions from Trampas Canyon into San Juan Creek to preserve breeding habitat for the arroyo toad population in San Juan Creek.

- Attempt to identify groundwater sources that are important to breeding pools and address potential management measures.

- Implement a bullfrog eradication program within San Juan Creek to help protect arroyo toads, with a special focus on Cal-Mat Lake and other water bodies that provide source concentrations of bullfrogs.

e. Restoration Recommendations

- In coordination with upstream eradication efforts, implement an arundo removal program for San Juan Creek within RMV boundaries to protect arroyo toad habitat.

- Implement an invasive plant species eradication effort in Cristianitos Creek between the confluences with Gabino and Talega creeks.

4.1.3 Least Bell's Vireo

Vireo bellii pusillus - Least Bell's vireo
USFWS: Endangered
CDFG: Endangered

a. Regional Status

The Bell's vireo, consisting of four subspecies, is widespread as a breeding species in the central and southwestern U.S. and northern Mexico. Its breeding range includes southern California, southern Nevada, southwestern Utah, northwestern and southern Arizona, southern New Mexico, central and southwestern Texas, eastern Colorado, central Nebraska, central South Dakota, south central North Dakota, southeastern Minnesota, southern Wisconsin, northeastern Illinois, and northwestern Indiana south to northern Baja, southern Sonora, southern Durango, Zacatecas, southern Nuevo Leon, southern Tamalpais, southern and eastern Texas, northwestern Louisiana, Arkansas, southwestern Tennessee, southwestern Kentucky, southern Indiana, and western Ohio

(Brown 1993). Although the winter range of Bell's vireo is not well known, generally it appears to winter from southern Baja and southern Sonora south along the west coast of Mexico and Central America to Honduras and casually to northern Nicaragua. It is also reported from the eastern coast of Central America from Veracruz south to Honduras (Brown 1993).

Zeiner et al. (1990) summarized the distribution, abundance, and seasonality of the subspecies least Bell's vireo (*V. b. pusillus*) within California. Least Bell's vireo formerly was a common and widespread summer resident below about 600 m (2,000 ft) in the western Sierra Nevada, throughout the Sacramento and San Joaquin valleys, and in the coastal valleys and foothills from Santa Clara County south. Least Bell's vireo also was common in coastal southern California from Santa Barbara County south, east of the Sierra Nevada below about 1,200 m (4,000 ft), in the Owens and Benton valleys, along the Mojave River and other streams at the western edge of southeastern deserts, and along the entire length of the Colorado River (Grinnell and Miller 1944). Two subspecies occur in California: *V. b. pusillus* (the least Bell's vireo described below) and *V. b. arizonae,* which is now a rare summer resident along the Colorado River from Needles, San Bernardino County, south to Blythe, Riverside County. Bell's vireo (subspecies uncertain) also breeds in at least two sites along the Amargosa River near Tecopa, Inyo County (Garrett and Dunn 1981).

As summarized in Table 4-4, the year 2001 distribution of confirmed territories (not necessarily confirmed breeding pairs) of the least Bell's vireo in California includes the counties of San Diego, Orange, Riverside, San Bernardino, Los Angeles, Ventura, Santa Barbara, Inyo, and Santa Clara (USFWS, pers. comm. 2002).

Most of the current populations of least Bell's vireo have undergone tremendous growth over the last decade. Census data collected over the past 16 years indicate that the population in southern California has increased from an estimated 300 pairs in 1986, an estimated 1,346 pairs in 1996 (USFWS 1998) and in 2001 an estimated 2,443 confirmed territories (USFWS, pers. comm., 2002).

TABLE 4-4
REGIONWIDE SUMMARY:
2001 STATUS OF LEAST BELL'S VIREO
WITHIN KNOWN BREEDING RANGE OF SOUTHERN CALIFORNIA

County	Confirmed Territories[1]
San Diego – excluding Camp Pendleton	883
San Diego – Camp Pendleton	783
Orange	111[2]
Riverside	500
San Bernardino	14

TABLE 4-4 (*Continued*)

County	Confirmed Territories[1]
Los Angeles	24
Ventura	124
Santa Barbara	12
Inyo	3
TOTAL CONFIRMED TERRITORIES	**2,443**

Notes:

[1] The number of confirmed territories is based on unpublished data provided by the USFWS in December 2002.

[2] The 2001 USFWS data base included about 100 confirmed territories in Orange County but does not include the 11 breeding pairs documented in lower Arroyo Trabuco in 2000. Also, Gobernadora Creek within GERA was estimated to support about 12-15 nesting locations based on 1998 and 2001 surveys, but the USFWS 2001 data base indicates 8 confirmed territories based on surveys in 2001 by P&D. The number cited in the table reflects the additional Arroyo Trabuco data and the 2001 P&D Gobernadora survey data.

The two largest concentrations of confirmed territories in the 2001 data base are in the Prado Basin in western Riverside County (444 territories) and on Camp Pendleton (785 territories). San Diego County, excluding Camp Pendleton, has the greatest total number of confirmed territories, with relatively large concentrations in the San Luis Rey River between College Avenue and Interstate 15 (132 territories), the Sweetwater River with 102 territories, the San Dieguito River with 45 territories, and various drainages in Anza Borrego with 105 territories. The Santa Clara River in Los Angeles and Ventura counties also supports a large concentration of territories, with 123 total territories in 2001.

The least Bell's vireo occupies a more restricted nesting habitat than the other subspecies of Bell's vireo, as summarized in USFWS (1986). Least Bell's vireos primarily occupy riverine riparian habitats that typically feature dense cover within one to two meters of the ground and a dense, stratified canopy. It inhabits low, dense riparian growth along water or along dry parts of intermittent streams. Typically it is associated with southern willow scrub, cottonwood forest, mule fat scrub, sycamore alluvial woodland, coast live oak riparian forest, arroyo willow riparian forest, wild blackberry, or mesquite in desert localities. It uses habitat that is limited to the immediate vicinity of watercourses below about 457 m (1,500 ft) elevation in the interior (USFWS 1986; Small 1994). In the coastal portions of southern California, the least Bell's vireo occurs in willows and other low, dense valley foothill riparian habitat and lower portions of canyons and along the western edge of the deserts in desert riparian habitat.

The breeding season for least Bell's vireo is typically mid-March to September (USFWS 1986). Males arrive a few days before females to establish breeding territories. Nests are typically built within 1 m (3.3 ft) of the ground in the fork of willows, wild rose (*Rosa californica*), mule fat (*Baccharis salicifolia*), or other understory vegetation (Franzreb 1989). Cover surrounding nests

is moderately open midstory with an overstory of willow, cottonwood, sycamore, or oak. Crown cover is usually more than 50 percent and contains occasional small openings. The most critical structural component to least Bell's vireo breeding habitat is a dense shrub layer at two to ten feet above the ground (Goldwasser 1981; Franzreb 1989). The birds typically forage in riparian habitat, but also use adjoining chaparral or scrub habitat (Salata 1983). These adjacent upland foraging habitats become relatively more important late in the breeding season.

Clutch sizes of the least Bell's vireo are between two to five eggs (typically three or four) that are laid shortly after nest construction (Salata 1984; Kus 1994; USFWS 1998). Incubation is about 14 days and young fledge about 12-14 days after hatching (Zeiner et al. 1990). Fledglings may range from established breeding territories, but remain under parental care for several more weeks (USFWS 1998). Least Bell's vireo usually produce only one brood per season, but additional broods up to four or five have also been reported (Franzreb 1989; USFWS 1998). Vireos typically depart by mid-September, but stragglers have been observed as late as November (Zeiner et al. 1990).

During the spring and fall migration, the Bell's vireo occupies a wider range of habitats including coastal sage scrub, riparian and woodland habitats. The winter range of habitats of the Bell's vireo include thornscrub vegetation adjacent to watercourses or in riparian gallery forests along the west coast of north and central Mexico. In southern Mexico and Honduras, tropical deciduous forest and arid tropical scrub along the coast is used (Brown 1993).

Bell's vireos are known to feed primarily on insects and spiders (Chapin 1925; Bent 1950; Terres 1980). The least Bell's vireo primarily forages in willow (*Salix* spp.) stands or associated riparian vegetation, with forays into upland vegetation including chaparral, sage scrub and oak woodlands later in the breeding season (Gray and Greaves 1984; Salata 1983; Kus and Minor 1989). Least Bell's vireos forage in a variety of tree and shrub species, with a preference for black willow (*Salix gooddingii*), arroyo willow (*Salix lasiolepis*), and mule fat (*Baccharis salicifolia*). Individuals are known to travel between 3 and 61 m (9.8 and 200 ft) (mean of 15.5 m [50.8 ft]) while foraging, with the majority of these destinations occurring within 30 m (98 ft) of the edge of riparian vegetation (Kus and Minor 1989). Least Bell's vireo are known to forage in all vertical vegetation layers from ground level to 20 m (66 ft), but most feeding is concentrated above the ground surface in the lower vegetation layers from ground level to 6 m (20 ft) (Kus and Minor 1989; Salata 1983). The least Bell's vireo exhibits year-round diurnal activity; and is known to be a nocturnal migrant (Brown 1993).

The literature on the dispersal and status remains unclear. Early data suggested that least Bell's vireos are strongly site tenacious, returning to the same site in close proximity to previously occupied territories (Salata 1983; Greaves 1987; 1989). More recent data suggest that least Bell's vireo may change breeding sites, but that additional study is needed (data from Kus cited in USFWS 1998).

Least Bell's vireo breeding territory sizes range from 0.2 to 3.0 hectares (ha) (0.5 acre [ac] to 7.4 ac) (Gray and Greaves 1984; Collins et al. 1989; Newman 1992) with most averaging between 0.3 to 1 ha (1 to 3 ac) (USFWS 1998). Territories in Bell's vireo are maintained by threat and physical confrontation early in the breeding season, tapering to vocal warnings later in the season (Barlow 1964).

b. Subregional Status

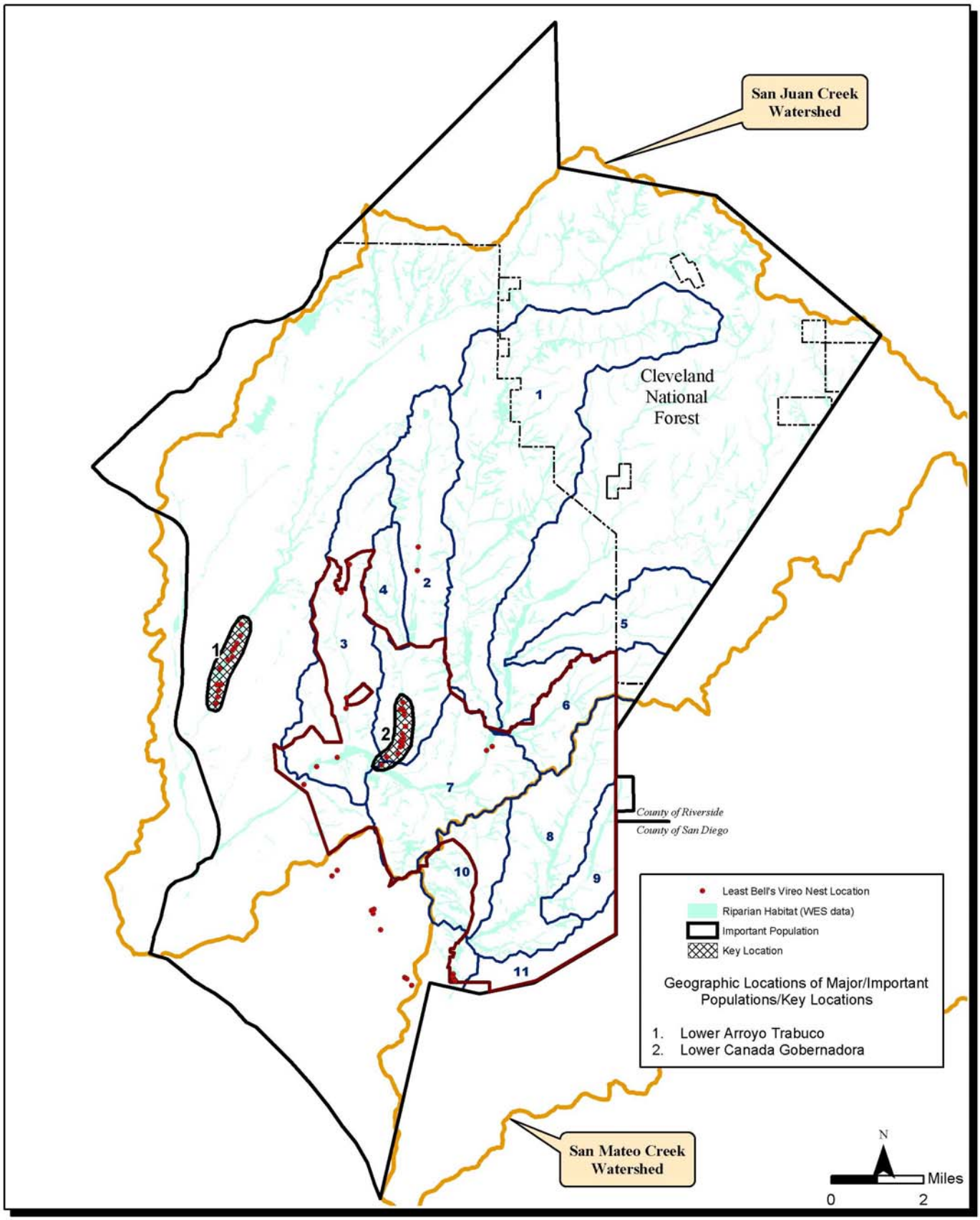
The NCCP data base includes 54 vireo nesting locations within the planning area (Figure 4-3). Surveys have documented nesting locations in Gobernadora Creek, middle San Juan Creek (between the Ortega Highway bridge and Casper Wilderness Park), lower Arroyo Trabuco, Chiquita Creek, lower Cristianitos Creek, and in isolated patches of willow scrub in Prima Deshecha and on the Talega development. Notably, planning area-wide surveys in 1998 failed to observe vireos in the remainder of riparian habitat in the planning area, including Gabino Canyon, La Paz Canyon, Blind Canyon, San Juan Creek above the Caspers Wilderness Park boundary, Bell Canyon, Verdugo Canyon, Lucas Canyon, Oso Creek, Tijeras Creek, upper Arroyo Trabuco, and Wagon Wheel Canyon. Much of the habitat in these areas consists of southern coast live oak riparian forest, which generally is unsuitable for the vireo. However, with the continued expansion of the breeding population of this species in southern California and changes in local habitat conditions, the future occurrence of the vireo in some of these areas is possible.

The planning area supports at least two *important populations* of the vireo in two *key locations*. These two areas combined include about 50 percent of the documented nesting locations in the planning area.

- Lower Arroyo Trabuco between Crown Valley Parkway and Avery Parkway supported 12 locations of the vireo in year 2000 surveys, of which 11 were documented breeding pairs (No. 1 on Figure 4-3). About the same number of nesting sites had been documented in the area in 1998 surveys. This area, which supports a well-developed stand of southern willow scrub, is included in the 90 ha (223 ac) added to O'Neill Regional Park as mitigation for the Arroyo Trabuco Golf Course.

- Lower Canada Gobernadora within GERA supports about 12-15 nesting locations based on 1998 and 2001 surveys (No. 2 on Figure 4-3).

It should be noted that recent observations include 10 confirmed territories and nine confirmed breeding pairs in the Prima Deshecha area (USFWS, pers. comm. 2002), but this area does not have a major, well-defined riparian system similar to Arroyo Trabuco or Canada Gobernadora. These observations suggest that vireos are opportunistic in selecting breeding sites, but whether this area should be considered an *important population* is uncertain because of the lack of a well-defined riparian system. It also should be noted that the three nesting locations in lower



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Least Bell's Vireo Distribution Map

FIGURE 4-3

Cristianitos are contiguous with numerous nest sites in lower Cristianitos and San Mateo Creek on Camp Pendleton, which should be considered a *major population* outside the planning area.

c. Protection Recommendations

- Protect breeding and foraging habitat for the least Bell's vireo along Chiquita Creek.

- Protect southern willow scrub in GERA that provides nesting and foraging habitat for least Bell's vireo.

- Maintain and manage riparian habitats along San Juan Creek that provides nesting and foraging habitat for the least Bell's vireo.

- Protect breeding and foraging habitat for least Bell's vireo in lower Cristianitos Creek between the RMV boundary and the confluence with Gabino Creek.

d. Management Recommendations

- Implement a cowbird trapping program to mitigate for impacts to existing habitat within the Chiquita, Gobernadora sub-basins, as well as the "other" planning area in lower Cristianitos, and for potential impacts associated with future development. The cowbird trapping program will be evaluated on an annual basis and trap locations and trapping effort will be adjusted as part of the overall adaptive management program (e.g., if the number of trapped cowbirds drops to a prescribed threshold, the trapping program may be terminated or otherwise modified).

- Protect downstream habitat in GERA, San Juan Creek, lower Cristianitos and San Mateo creeks for the least Bell's vireo by maintaining hydrology, water quality and sediment delivery and minimizing additional loadings of nutrients or toxics.

e. Restoration Recommendations

- Implement restoration efforts to address localized headcuts within Chiquita Creek, as further described in the Watershed and Sub-basin Planning Principles – Chiquita Sub-basin.

- Implement a restoration program in Gobernadora Creek which addresses 1) the historic creek meander above the knickpoint; and 2) upstream land use induced channel incision and erosion, including potentially excessive surface and groundwater originating upstream.

- Identify likely causes of erosion and potential measures to rectify causes of headcutting in the lower portion of Gobernadora Creek.

4.1.4 Southwestern Willow Flycatcher

Empidonax traillii extimus - Southwestern Willow Flycatcher
USFWS: Endangered
CDFG: Endangered

a. Regional Status

The full species willow flycatcher (*Empidonax traillii*) breeds throughout much of North America, absent only from the Central Plains and southeastern U.S. The breeding range of the subspecies southwestern willow flycatcher (*E. t. extimus*) includes southern California, Arizona, New Mexico, extreme southern portions of Nevada and Utah, far western Texas, southwestern Colorado, and extreme northwestern Mexico (USFWS 1993). Within California, the specific breeding range for this subspecies includes the Owens Valley; the south fork of the Kern River; the Los Angeles Basin (Unitt 1987; Zeiner et al. 1990); the Santa Ynez River near Buellton; the Prado Basin riparian forest in Riverside County; the Santa Margarita and San Luis Rey rivers in San Diego County; Middle Peak in the Cuyamaca Mountains; near Imperial Beach (Small 1974); and most recently lower Gobernadora Creek in southern Orange County. This subspecies overwinters in Mexico (USFWS 1995). Areas along the Rio Grande provide important refueling sites for flycatchers as they migrate between their breeding and wintering grounds (Yong and Finch 1997).

Based on survey data collected between 1993 and 1996, a total of 549 territories was estimated for the entire breeding range of the southwestern willow flycatcher. Since that time, at least 386 of these territories have been documented as confirmed probable breeding pairs (Finch and Stoleson 2000). Within California, there are an estimated 121 breeding territories (Finch and Stoleson 2000) which appear to be scattered around southern California. The population size in the Santa Margarita River from Camp Pendleton to Fallbrook is an estimated 15-16 territories (San Diego Museum of Natural History 1995). Within western Riverside County, there are an estimated 15-20 territories, including three to five territories in the Prado Basin, three to five territories in the Santa Ana River, two to four territories at Vail Lake, and three territories in Temecula Creek (DUDEK 2002).

The southwestern willow flycatcher is restricted to riparian woodlands along streams and rivers with mature, dense stands of willows (*Salix* spp.), cottonwoods (*Populus* spp.) or smaller spring fed or boggy areas with willows or alders (*Alnus* spp.) (Sedgwick and Knopf 1992). It is an insectivore that forages within and above dense riparian vegetation, taking insects on the wing or gleaning them from foliage (USFWS 1993). This species also forages in areas adjacent to nest sites which may be more open (USFWS 1995).

Southwestern willow flycatchers breed in relatively dense riparian habitats in all or parts of seven southwestern states from near sea level in California to over 2,600 m (8,500 ft) in Arizona and Colorado (USFWS 2001).

The migration routes and winter destinations of the southwestern willow flycatcher are not well understood. They most likely winter in Mexico, Central America, and perhaps northern South America; however, the habitats used by willow flycatchers on the wintering grounds are unknown (USFWS 1993). The species has been reported to sing and defend winter territories in Mexico and Central America.

The southwestern willow flycatcher nests from ground level to 4 m (13 ft) above ground in thickets of trees and shrubs approximately 4-7 m (13-23 ft) with a high percentage of canopy cover and dense foliage. The nest site plant community typically is even-aged, structurally homogeneous and dense (Brown 1988; Whitfield 1990; Sedgwick and Knopf 1992). Historically, the willow flycatcher nested primarily in willows and mule fat with a scattered overstory of cottonwood (Grinnell and Miller 1944). Although the species still nests in willows where available, with recent non-native invasions of riparian plant communities in the region, the flycatcher also is known to nest in thickets dominated by tamarisk and Russian olive (Hubbard 1987; Brown 1988). Regardless of the plant species composition or height, occupied sites always have dense vegetation in the patch interior and in most cases this dense vegetation occurs within the first 3-4 m (9-13 ft) above ground (USFWS 2001). This species usually nests in the upright fork of a shrub but occasionally nests on horizontal limbs within trees and shrubs (Terres 1980). Typically, sites selected as song perches by male willow flycatchers show higher variability in shrub size than do nest sites and often include large central shrubs. Nest sites are distinguished by high willow density and low variability in willow patch size and bush height. Habitats avoided for either nesting or singing typically are riparian zones with greater distances between willow patches and individual willow plants (Sedgwick and Knopf 1992). Nesting willow flycatchers invariably prefer areas with surface water nearby (Phillips et al. 1966). In almost all cases, slow-moving or still surface water and or saturated soils are present at or near the breeding sites during normal precipitation years (USFWS 2001). Suitable flycatcher habitat is most likely to develop in more extensive patches along lower gradient streams with wider floodplains, although there are exceptions to this habitat characterization (e.g., San Luis Rey River) (USFWS 2001). Suitable habitat is less likely to occur in steep, confined streams characteristic of narrow canyons (USFWS 2001).

Males typically arrive in southern California at the end of April and females arrive approximately one week later. They have a home range larger than the defended territory and territorial defense begins in late May. Territory sizes range from 0.24 to 0.45 ha (0.6 to 1.1 ac) and territories can be dense in suitable habitat; the documented maximum is six females and five males in only 4.4 ha (10.9 ac) (San Diego Natural History Museum 1995). Sogge et al. (1997; cited in USFWS 1995), found territorial flycatchers in habitat patches ranging from 0.5 to 1.2 ha (1.2 to 3.0 ac). Two habitat patches of 0.5 (1.2 ac) and 0.9 ha (2.2 ac) each supported two territories in this study (Sogge et al. 1997). Alternatively, southwestern willow flycatchers do

not always pack their territories into all available space within a habitat (USFWS 2001). Instead, some territories may be bordered by undefended riparian habitat that could be important in attracting flycatchers to the site or in providing post-nesting use and dispersal areas.

The southwestern willow flycatcher usually is monogamous within a nesting season, but not all territorial males are mated (San Diego Natural History Museum 1995). Pairs typically raise one brood per year (USFWS 1993). Clutch sizes range from two to five, with an average of 3.4 eggs in coastal southern California. Southwestern willow flycatcher fledglings leave the nest at age 12-15 days post-hatching (usually in early July) and disperses from their natal territory at a minimum age of 26-30 days (USFWS 1993). About 25 percent of adults return to their territory from the previous year. At least 20 percent of juveniles return to their "natal areas" which are usually within 2 to 4 km (1.6 to 2.5 mi) of their natal territory. Although nest reuse is not common by the southwestern willow flycatcher, recent studies have reported a low percentage of nest reuse by this species (Yard and Brown 1999). Adults usually depart from breeding territories between mid-August and early September (San Diego Natural History Museum 1995).

b. Subregional Status

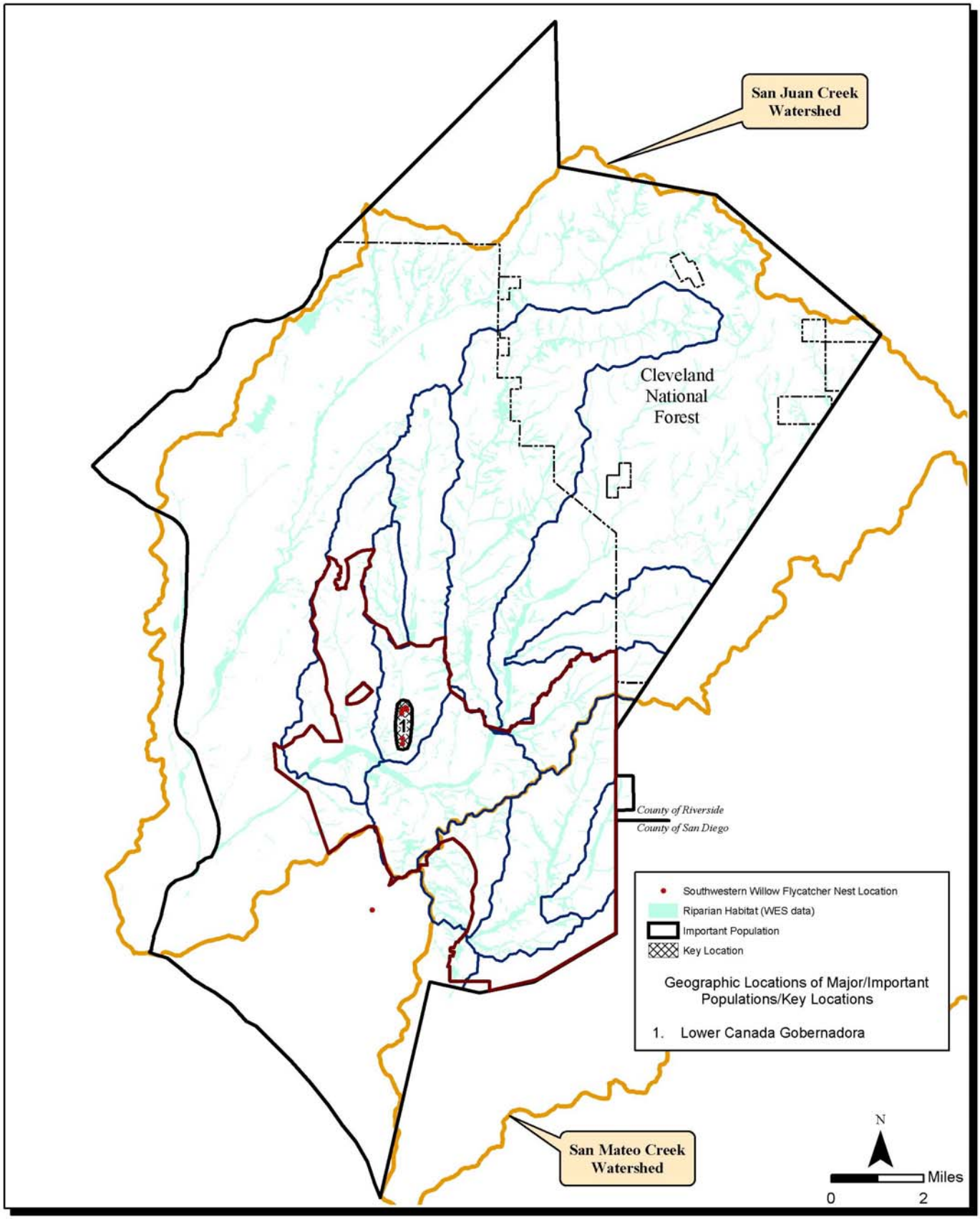
The southwestern willow flycatcher is known to nest in two locations in the planning area; in GERA and in an isolated patch of riparian habitat in Talega development open space in the year 2000 (Figure 4-4). A calling male was detected in 1998 in lower Chiquita Canyon by Harmsworth Associates but there was no evidence of breeding activity. The GERA location is the only *important population* of willow flycatcher in the planning area and also is considered a *key location* for the species (No. 1 on Figure 4-4). Planning area-wide surveys in 1998 failed to find the willow flycatcher elsewhere in the planning area and the habitat in these areas was judged to be generally unsuitable for the species. However, as with the vireo, there is a possibility that this species could occur in other riparian areas, and the observation of a breeding pair in the isolated riparian area on Talega in 2000 suggests that occasional or sporadic breeding at other sites in the planning area is possible.

c. Protection Recommendations

- Protect southern willow scrub in GERA that provides nesting habitat for southwestern willow flycatcher.

d. Management Recommendations

- Implement a cowbird trapping program to mitigate for impacts to existing habitat within the Gobernadora sub-basin and for potential impacts associated with future development. The cowbird trapping program will be evaluated on an annual basis and trap locations and trapping effort will be adjusted as part of the overall adaptive management program (e.g., if the number of trapped cowbirds drops to a prescribed threshold, the trapping program may be terminated or otherwise modified).



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Southwestern Willow Flycatcher Distribution Map

FIGURE 4-4

- Protect downstream habitat in GERA and lower Cristianitos and San Mateo creeks for the southwestern willow flycatcher by maintaining hydrology, water quality and sediment delivery and minimizing additional loadings of nutrients or toxics.

e. Restoration Recommendations

- Implement a restoration program in Gobernadora Creek which addresses 1) the historic creek meander above the knickpoint; and 2) upstream land use induced channel incision and erosion, including potentially excessive surface and groundwater originating upstream.

- Identify likely causes of erosion and potential measures to rectify causes of headcutting in the lower portion of Gobernadora Creek.

4.1.5 Riverside Fairy Shrimp

Streptocephalus woottoni - Riverside Fairy Shrimp
USFWS: Endangered
CDFG: None

a. Regional Status

Riverside fairy shrimp is restricted to southwestern California and northwestern Baja California. It occurs from southern Ventura County south and east through Orange and western Riverside counties to coastal San Diego County (primarily Camp Pendleton and Otay Mesa) and the vicinity of Baja Mar north of Ensenada in Baja California, Mexico. With the exception of the Riverside populations, all populations are within 15 km (9.3 mi) of the coast (Eriksen and Belk 1999). All known populations lie between 30 m (98 ft) and 415 m (1,361 ft) in elevation.

The *Recovery Plan for Vernal Pools of Southern California* (USFWS 1998) identified six Management Areas for the Riverside fairy shrimp:

1. **Los Angeles/Orange County:** This Management Area includes three areas in southern Orange County known to support the Riverside fairy shrimp – Saddleback Meadows/Foothill-Trabuco area, RMV property, and El Toro.

2. **Riverside County:** This Management Area includes three areas in western Riverside County – Temecula, Skunk Hollow, and the Santa Rosa Plateau. Recent data have revised and refined this distribution to include at least five extant populations in western Riverside County, including Skunk Hollow, Santa Rosa Plateau, Murrieta, Alberhill, and Lake Elsinore populations, plus an unnamed location that apparently includes a series of private stockponds (USFWS 2001). Other undiscovered populations may occur in this area (DUDEK 2002). The Skunk Hollow pool is protected as part of a mitigation bank

and the Santa Rosa Plateau complex is on the Ecological Reserve owned and managed by The Nature Conservancy.

3. **San Diego North Coastal Mesas:** This Management Area includes MCB Camp Pendleton and Carlsbad. The Pendleton pool complexes are located in the Wire Mountain Housing Area, Cockleburr Mesa, Las Pulgas, Stuart Mesa, San Mateo and on lands leased to State Parks. The Pendleton complexes represent one of the largest populations of the Riverside fairy shrimp (USFWS 2001). The Carlsbad pools are located at the Poinsettia Land Station and are mitigation lands.

4. **San Diego Central Coastal Mesas:** This Management Area includes the Marine Corps Air Station Miramar. Only one complex supporting the Riverside fairy shrimp is known from this Management Area. This complex is in the Miramar Marine Corps Air Station (MCAS) and is managed by the Department of Defense (DOD).

5. **San Diego South Coastal Mesas:** This Management Area includes Otay Mesa. Six complexes in the Otay area support Riverside fairy shrimp, of which five are on private property and one is on City of San Diego property. Two of the five private complexes and the City site are on mitigation land.

6. **Transverse:** This Management Area is located in inland valleys and mesas north of the Los Angeles Basin in association with the Transverse Mountain Ranges. The Riverside fairy shrimp is known from the Carlsberg Ranch vernal pool in Moorpark, on the northern edge of the Santa Monica Mountains in Ventura County. This vernal pool represents a northern limit of the species, and is now in preserved open space under the management of the Santa Monica Mountains Conservancy.

Vernal pools that support the Riverside fairy shrimp primarily occur on mesas and other level terrain generally less than 10 percent. These areas often exhibit a characteristic microrelief called Gilgai or mima mound formation. The species may also occur in ditches and road ruts, but only in areas associated with degraded vernal pool habitat. Because of the distinctive topography supporting vernal pools, pools typically are clustered in "complexes," including dense clusters of small pools or scattered clusters of large pools that often share a common watershed (USFWS 2000).

Vernal pools in general are associated with heavy soils that prevent the percolation of water. Southern California vernal pools are most often found in alluvial soils with clay or clay loam subsoils. Basaltic or granitic substrates or indurated hardpan layers may contribute to poor drainage and retention of water (USFWS 1998). The size of vernal pools can vary dramatically, from just a few square meters to the size of small lakes (e.g., Skunk Hollow in western Riverside County). The size of the vernal pool is related to the watershed of the pool and the local micro-relief.

The Riverside fairy shrimp is restricted to deep seasonal vernal pools, vernal pool-like ephemeral ponds, and stock ponds and other human modified depressions (Eng et al. 1990; USFWS 1993, USFWS 2001). Riverside fairy shrimp prefer warm-water pools that have low to moderate dissolved solids, are less predictable, and remained filled for extended periods of time (Eriksen and Belk 1999). Basins that support Riverside fairy shrimp are typically dry a portion of the year, but usually are filled by late fall, winter or spring rains, and may persist through May (USFWS 2001). All known vernal pool habitat lies within annual grasslands, which may be interspersed through chaparral or coastal sage scrub vegetation.

Females produce between 17 and 427 cysts over their lifetime (Simovich and Hathaway 1997). Presumably because of the ephemeral and unpredictable nature of the pool resource, few of the available cysts hatch at a time (Eriksen and Belk 1999). Cysts may hatch when water temperature is at 10 degrees C (50 degrees F) but develop slowly below 15 degrees C (59 degrees F) (Eriksen and Belk 1999). Hathaway and Simovich (1996) found that Riverside fairy shrimp hatched in seven to 12 days when water temperatures were between 10 and 20 degrees C (50 and 68 degrees F) and maturity was noted between 48 to 56 days.

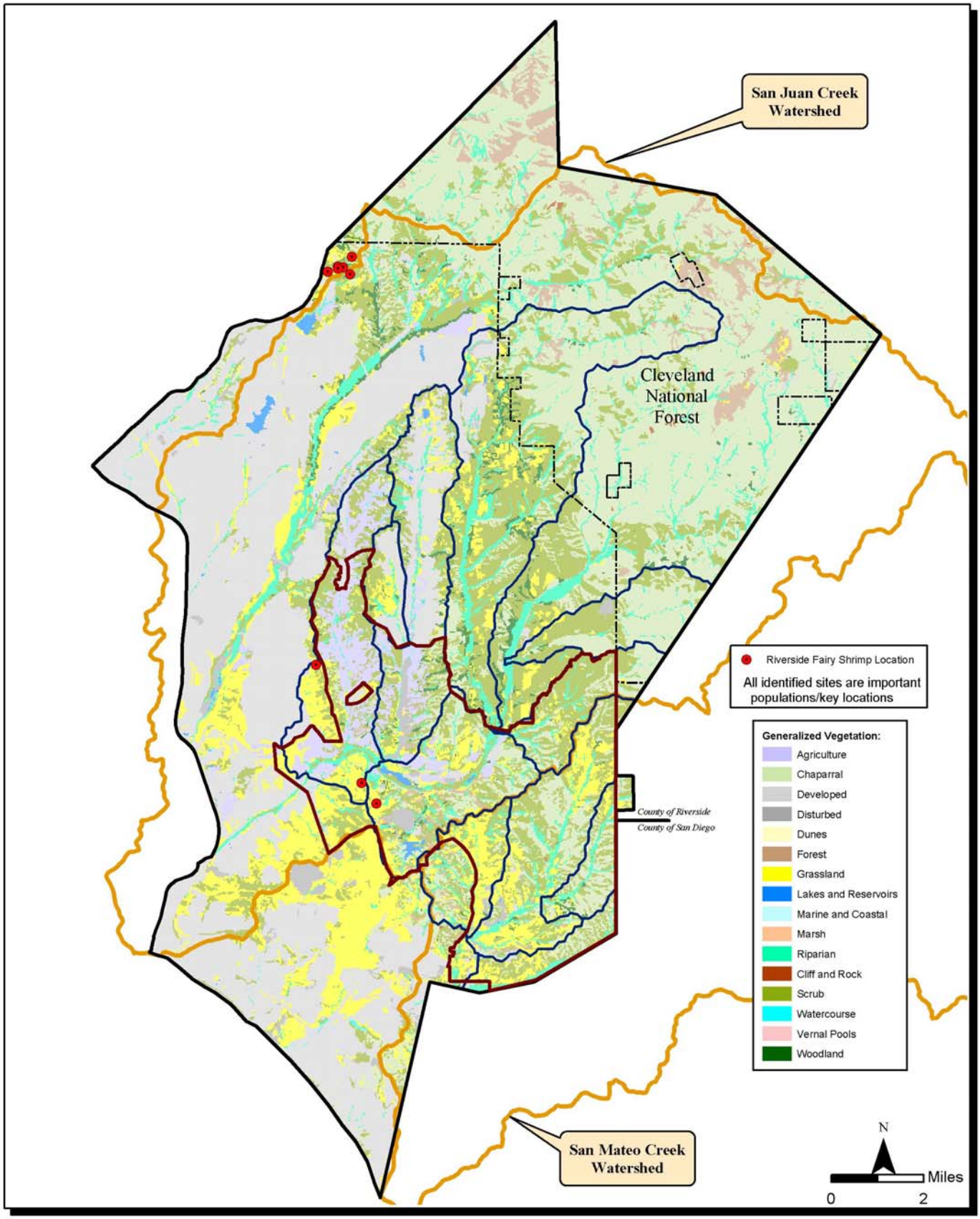
Dispersal in fairy shrimp is likely mediated by vectors such as waterfowl, cattle, sheep, dogs and even off-road vehicles (e.g., rubber-tired or tracked vehicles) that move through or wallow in inhabited wet or dry pools. Wildlife and vehicles transport cysts or pregnant or mature adults between dry depressions or extant pools. Cysts may also disperse like some plant seeds by passing through an animal's gut after it ingests pregnant females or cysts in drinking water and then eliminates in other suitable depressions or pools.

b. Subregional Status

In the planning area, the Riverside fairy shrimp is known from vernal pools on Saddleback Meadows in the northwest portion, two pools near the intersection of Antonio Parkway and the FTC-North segment, a very large population in a large pool on Chiquita Ridge and in two pools located along Radio Tower Road (pools 2 and 7) (Figure 4-5). Because this species is rare in the subregion, all vernal pools supporting the Riverside fairy shrimp are considered *important populations* in *key locations*.

The geology of the vernal pools in the planning area is different from that underlying mima mounds found on the mesas of San Diego County. The Chiquita Ridge and Radio Tower Road pools originate from young bedrock slides associated with the Cristianitos fault zone. The formation of these vernal pools apparently derives from the differential settling of fine-grained materials (high clay content) from San Onofre Breccia, Monterey and Topanga formations. These pools are underlain by Soper gravelley loam on 15-30 percent slopes and Alo clay on 0-15 percent slopes.

On RMV, the Riverside fairy shrimp was found in pools ranging in depth from 22 to 41.9 cm (8.7 to 16.5 in). Water temperatures of these pools ranged from 15 to 20 degrees C (59 to



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Riverside Fairy Shrimp Distribution Map

FIGURE 4-5

84 degrees F). The percent dissolved oxygen was 0.02 to 6.0 and the total dissolved solids was 61-364 parts per million.

c. Protection Recommendations

- Protect the two vernal pools that support the Riverside fairy shrimp and their contributing hydrologic sources along Radio Tower Road. The Chiquita Ridge pools are already protected in Ladera Open Space.

d. Management Recommendations

- Implement a management program for vernal pools, including control of non-native invasive species, management of grazing and minimization of human access and disturbance as part of the adaptive management program.

4.1.6 San Diego Fairy Shrimp

Branchinecta sandiegonensis - San Diego Fairy Shrimp
USFWS: Endangered
CDFG: None

a. Regional Status

The San Diego fairy shrimp is restricted to vernal pools in coastal southern California and Baja California, Mexico. Its current range in coastal southern California includes western San Diego County and southern and central Orange County. All known localities of the species are below 700 m (2,300 ft) and are within 64 km (40 mi) of the Pacific Ocean (USFWS 2000). The largest concentration of vernal pools supporting the San Diego fairy shrimp is in San Diego County, with an estimated 82 ha (202 ac) of occupied vernal pool basins in the County at the time of the species' listing in 1997. Of this occupied habitat, approximately 70 percent is on military lands, including the Miramar MCAS and Camp Pendleton (USFWS 2000). The USFWS (2000) concluded that vernal pool habitat in Los Angeles and Orange counties has been almost completely lost.

The *Recovery Plan for Vernal Pools of Southern California* (USFWS 1998) identified five Management Areas for the San Diego fairy shrimp:

1. **Los Angeles/Orange County:** This Management Area includes Fairview Regional Park in Orange County that supports a vernal pool complex of about eight pools on 25 ha (62 ac) inhabited by the San Diego fairy shrimp (USFWS 2000). This park is located east of the Santa Ana River and north of Victoria Street in Costa Mesa. The other Management Area is Rancho Mission Viejo, as described below under Subregional Status. Another

Orange County population is known from Newport Banning Ranch (T. Bomkamp, pers. comm. 2002).

2. **San Diego North Coastal Mesas:** This Management Area includes complexes and pools on the coastal terraces on Camp Pendleton such as the State Park lease area, San Mateo, O'Neill, Stuart Mesa, Cockleburr Mesa, Las Pulgas, Basilone and Wire Mountain. This Management Area also includes two sites in the City of Carlsbad: a complex north of Poinsettia Lane between I-5 and Highway 1 (Carlsbad Boulevard) in the vicinity of the Poinsettia Lane train station and a complex between College Boulevard and Palomar Airport Road in the vicinity of Palomar Airport. The Poinsettia Lane location is on mitigation land.

3. **San Diego Central Coastal Mesas:** This Management Area includes pools and complexes on Del Mar Mesa, Kearney Mesa, Miramesa, MCAS Miramar, and Tierrasanta associated with coastal terraces and mesas in central San Diego County from the San Dieguito River to the Sweetwater River. As of 1998, the Central Coastal Mesas were known to support 41 complexes with San Diego fairy shrimp. Of these, 29 are on DOD land, five on private lands, three on City of San Diego land, one each on Grossmont College and City of San Diego School District lands, and two on Caltrans lands. Of the 29 on DOD land, 25 are managed for biological resources, three were proposed as refuge in 1998, and one was developed. Of the five complexes on private lands, two are mitigation land. One of the three City of San Diego complexes is mitigation and both of the Caltrans complexes are mitigation.

4. **San Diego Inland Valley:** This Management Area includes a large set of complexes in the Ramona area (Santa Maria Valley). These inland complexes are generally isolated from maritime influences and are representative of pools associated with alluvial or volcanic soil types. Although some of these pools are known to support the San Diego fairy shrimp, the occupancy status of all the pools is not known (USFWS 2000). As of 1998, six complexes were known to support the San Diego fairy shrimp, of which five are on private land and one within San Diego County's Ramona Airport boundaries.

5. **San Diego South Coastal Mesas:** This Management Area includes pools and complexes from the Sweetwater River to the Mexican border. Vernal pools with San Diego fairy shrimp are located in the Tijuana Estuary Wildlife Refuge, western and eastern Otay Mesa, the Otay Lakes area, and Proctor Valley. As of 1998, seven complexes in this Management Area were known to support the San Diego fairy shrimp (USFWS 1998). Of these seven, five are on private land, one is on City of San Diego land, and one is on Navy land. Three of the privately owned complexes and the City of San Diego complex are mitigation lands.

Vernal pools that support the San Diego fairy shrimp primarily occur on mesas and other level terrain generally less than 10 percent. These areas often exhibit a characteristic microrelief

called Gilgai or mima mound formation. The species may also occur in ditches and road ruts, but only in areas associated with degraded vernal pool habitat. Because of the distinctive topography supporting vernal pools, pools typically are clustered in "complexes," including dense clusters of small pools or scattered clusters of large pools that often share a common watershed (USFWS 2000).

Vernal pools in general are associated with heavy soils that prevent the percolation of water. Southern California vernal pools are most often found in alluvial soils with clay or clay loam subsoils. Basaltic or granitic substrates or indurated hardpan layers may contribute to poor drainage and retention of water (USFWS 1998). The size of vernal pools can vary dramatically, from just a few square meters to the size of small lakes (e.g., Skunk Hollow in western Riverside County). The size of the vernal pool is related to the watershed of the pool and the local micro-relief.

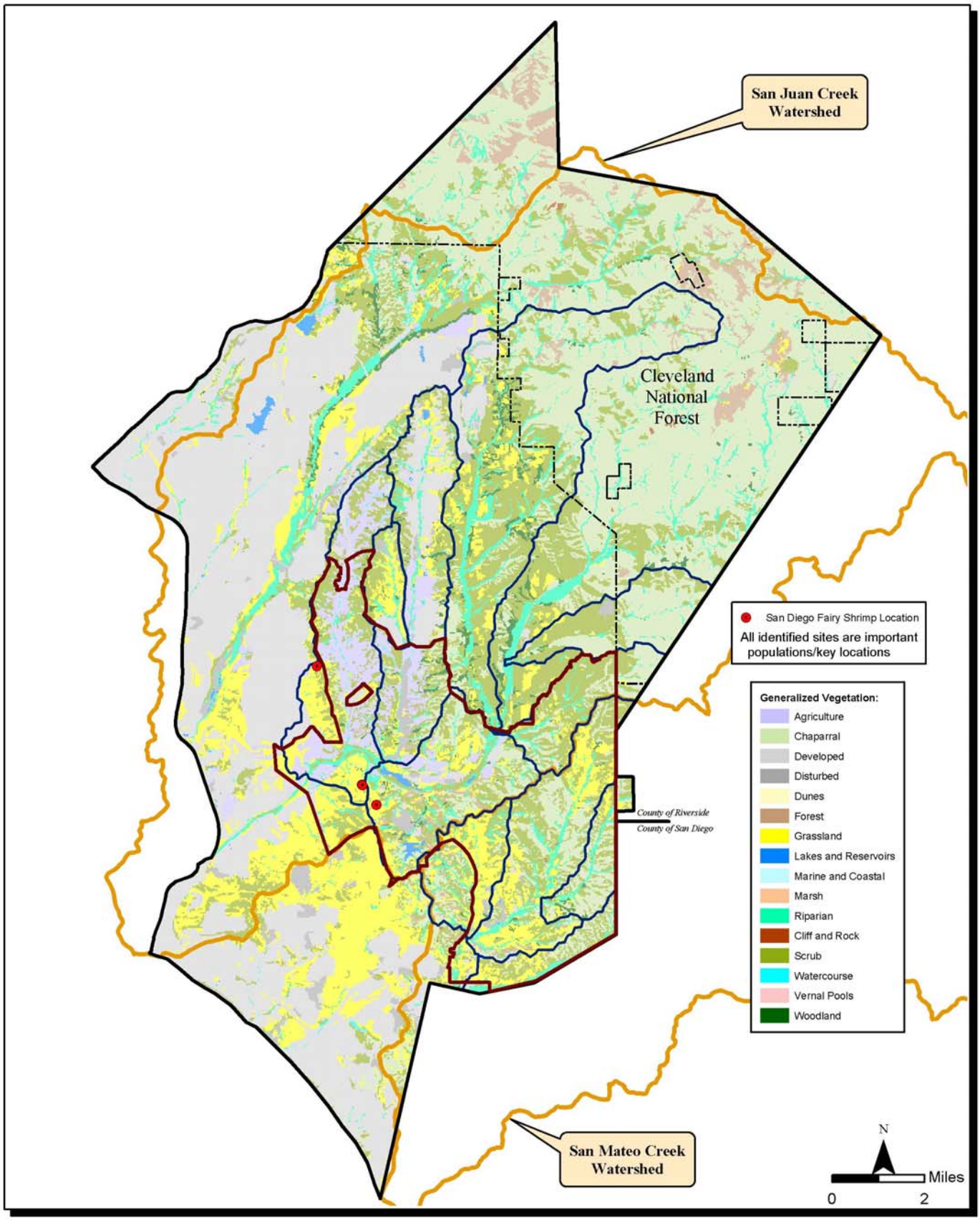
The San Diego fairy shrimp occurs in small, shallow vernal pools ranging in depth from 5.1 to 30.5 cm (2 to 12 in) and in water temperatures from 10 and 14.5 degrees C (50 to 58 degrees F). Water temperature and chemistry are important factors in the species' distribution. Adults are usually observed in January-March when pools hold water from winter rains, although the breeding season may be extended in association with early winter or mid-spring rains (USFWS 2000). Eggs are either dropped to the pool bottom or remain in the brood sac until the adult female dies and sinks. The shrimp hatch and mature in seven days to two weeks, depending on water temperature. "Resting eggs" of cysts are capable of withstanding heat, cold and prolonged drying (USFWS 2000). Because the high variability rainfall in southern California, and thus the success of any given breeding season, only a fraction of cysts may hatch in a given year and reproductive success can be spread out over several years (USFWS 2000).

Dispersal in fairy shrimp is likely mediated by vectors such as waterfowl, cattle, sheep, dogs and even off-road vehicles (e.g., rubber-tired or tracked vehicles) that move through or wallowing in inhabited wet or dry pools. Wildlife and vehicles transport cysts or pregnant or mature adults between dry depressions or extant pools. Cysts may also disperse like some plant seeds by passing through an animal's gut after it ingests pregnant females or cysts in drinking water and then eliminates in other suitable depressions or pools.

b. Subregional Status

The San Diego fairy shrimp occurs in two locations in the planning area: in the large and small vernal pools on Chiquita Ridge (vernal pools 3 and 4) and in three pools located along Radio Tower Road south of Ortega Highway (vernal pools 1, 2 and 7) (Figure 4-6). Because this species is rare in the region, both locations are *important populations* in *key locations*.

The geology of the vernal pools in the planning area is different from that underlying mima mounds found on the mesas of San Diego County. The Chiquita Ridge and Radio Tower Road pools originate from young bedrock slides associated with the Cristianitos fault zone. The



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San Diego Fairy Shrimp Distribution Map

FIGURE 4-6

formation of these vernal pools apparently derives from the differential setting of fine-grained materials (high clay content) from San Onofre Breccia, Monterey and Topanga formations. These pools are underlain by Soper gravelley loam on 15-30 percent slopes and Alo clay on 0-15 percent slopes.

The San Diego fairy shrimp was found in pools ranging in depth from 17.0 to 41.9 cm (6.7 to 16.5 in). Water temperatures of these pools ranged from 11 to 23 degrees C (52 to 73 degrees F). The percent dissolved oxygen was 2.3 to 5.36 and the total dissolved solids was 51-166 parts per million.

c. Protection Recommendations

- Avoid impacts to the three vernal pools (1, 2 and 7) that support the San Diego fairy shrimp and their contributing hydrologic sources along Radio Tower Road. The Chiquita Ridge pools are already protected in Ladera Open Space.

d. Management Recommendations

- Implement a management program for vernal pools, including control of non-native invasive species, management of grazing and minimization of human access and disturbance as part of the adaptive management program.

4.1.7 Thread-leaved Brodiaea

Brodiaea filifolia - Thread-leaved Brodiaea
Federal: Threatened
State: Endangered
CNPS: List 1B

a. Regional Status

Thread-leaved brodiaea is a perennial geophyte that has a corm with a dark brown, fibrous tunic. The flowering stalk is 20.3-40.6 cm (8-16 in) high and the narrow leaves are generally shorter than the flowering stem. The flowers are dark blue to violet and have six perianth segments. There are three stamens and three staminodia (sterile stamens), which are narrow and thread-like in each flower.

The thread-like staminodia are the feature which distinguishes this species from other related brodiaea occurring in southern California. This species reportedly hybridizes with *B. orcuttii* and *B. terrestris*, but these species have different chromosome numbers, so hybridization events should be rare (chromosome counts need to be confirmed, sources are inconsistent). In Riverside County a large reported hybrid swarm occurs on Miller Mountain and Elsinore Peak and reported hybrids are also found in populations on the Santa Rosa Plateau.

Counts of flowering stalks are often used to determine the size of brodiaea populations. Although a good index, it appears that there may be higher number of corms in the ground than is indicated by the number of flowering plants. In 1998, the USFWS cited an instance where in a recorded population of 20 flowering stalks, over 8,000 corms were recovered (USFWS 1998). Other botanists have used a general range of indices of 5 to 100 corms for every flowering stalk observed (pers. comms., Bomkamp and Elvin 2002).

In the Transverse Ranges, the thread-leaved brodiaea is known to occur in the foothills of the San Gabriel Mountains, east to Arrowhead Hot Springs in the San Bernardino Mountains. Populations are also found in southern Orange, western Riverside, and northwestern San Diego counties. In 1998, the USFWS estimated that 50 extant populations occurred in southern California, with the majority consisting of sites supporting less than 2,000 plants (USFWS 1998). Since 1998, some of these populations have been extirpated, while additional populations have been identified in Riverside, Los Angeles, San Diego and Orange counties. The exact number of extant populations is not known, but it is likely between 40 and 50. Most of these additional populations occur in northwest San Diego County. Similarly, in 1998 the USFWS estimated that 338 ha (835 ac) of occupied habitat occur within the range of this species; however, based upon extirpations and additional occurrences identified between 1998 and 2001, an estimate of somewhat less than 338 ha (835 ac) is more likely. As shown in Table 4-5, the largest locality is found in San Marcos in northern San Diego County with an estimated range of 201,200 to 342,000 flowering stalks, while the largest population in Riverside County is found on the Santa Rosa Plateau with over 30,000 flowering stalks estimated to occur on the ecological reserve. The largest extant populations in Orange County occur at Aliso-Woods Regional Park, consisting of several thousand plants and on Rancho Mission Viejo (see below). The largest population in Los Angeles County occurs in Glendora, containing an estimated 2,000 to 3,000 flowering stalks.

In western Riverside County this species is known to occur on the Santa Rosa Plateau; Upper Salt Creek, west of Hemet; the San Jacinto Wildlife Area (two localities); Perris, east of the Perris Valley Airport (approximately 5,000 flowering stalks); south of San Jacinto Road (<500 individuals); and in Railroad Canyon where approximately 3,000 plants are associated with *Sporobolus*-dominated alkali grassland.

In Orange County, populations are known from Aliso-Woods Canyon Regional Park (several thousand), Rancho Mission Viejo (4,500 to 5,500 flowering stalks), Forster Ranch (approximately 5,000 flowering stalks associated with a restoration/relocation program), Prima Deshecha Landfill, and the Talega Development where one small population will be preserved in open space and a second population is slated for translocation.

TABLE 4-5
REGIONWIDE SUMMARY:
2002 STATUS OF THREAD-LEAVED BRODIAEA
WITHIN KNOWN RANGE IN SOUTHERN CALIFORNIA

Regional Major Population Area(s)	Brodiaea Population: Number of Counted/Estimated Plants
San Marcos and Northern San Diego County Excluding Camp Pendleton	350,000 to 400,000 (estimated)[1] 201,200 (estimated)[2]
Camp Pendleton and San Onofre State Park	5,000 (estimated)
San Jacinto River and Hemet, Riverside County	10,000
Santa Rosa Plateau, Riverside County	30,000
Los Angeles County (Glendora and San Dimas)	2,000 to 3,000
Orange County	11,650 to 14,650
APPROXIMATE TOTAL PLANTS REGIONWIDE: 259,850 to 462,650	
Orange County Population Summary	
Rancho Mission Viejo	Approximately 4,500 to 5,500
Aliso-Woods Park	Approximately 2,000 to 3,000
Talega and Forster Ranch Developments	5,000 to 6,000
Arroyo Trabuco Golf Course	150
ORANGE COUNTY SUMMARY	**11,650 to 14,650+**

Notes:

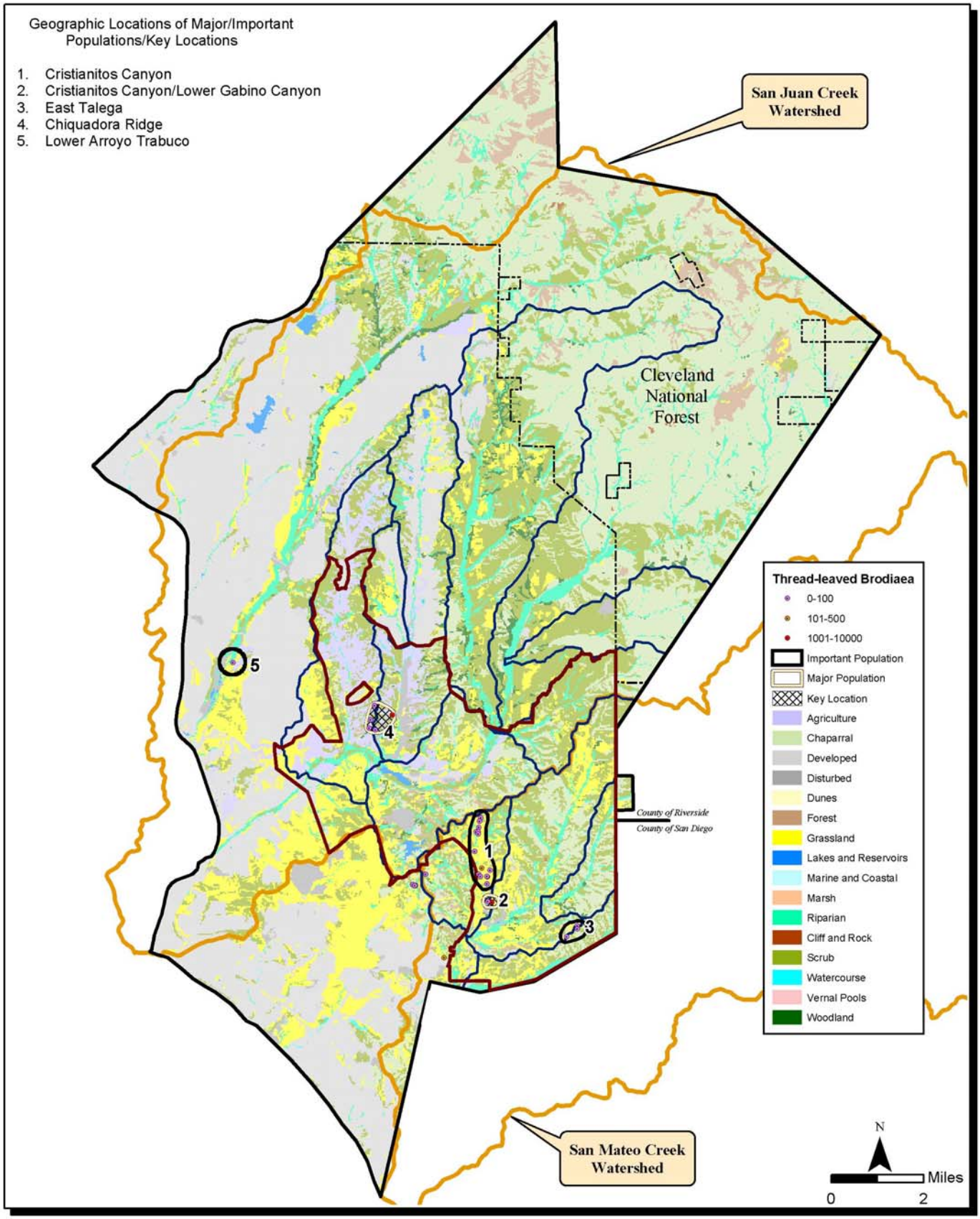
[1] USFWS 1998

[2] SANDAG GIS Database 2000. Locations of Sensitive Species Sitings (Sue Carnavale, pers. comm.)

b. Subregional Status

Thread-leaved brodiaea is found in five general locations in the planning area (Figure 4-7), excluding the translocated population at Forster Ranch: Chiquadora Ridge; Cristianitos Canyon; lower Gabino Canyon; Talega ridgeline east of TRW; and just east of Trabuco Creek in the Arroyo Trabuco Golf Course project area. The 4,500-5,500 flowering stalks known from the planning area are a small percentage (about 1 percent) of the thread-leaved brodiaea range-wide, but represent an important geographic segment of the species. However, conservation of this species is most dependent on protection of the two largest concentrations in north San Diego County and western Riverside County (see Table 4-5).

Within the planning area, this species is associated with purple needlegrass grasslands and grassland/sage scrub ecotone areas. In many instances, the needlegrass grasslands exhibit low densities of native bunch grasses and support non-native English ryegrass (*Lolium multiflorum*) and cardoon (*Cynara cardunculus*). In all cases, the brodiaea is associated with clay soils; often times that occur as lenses in cobbly loams, clay loams or sandy clay loams. In such instances, the brodiaea is restricted to the clay lenses.



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Thread-leaved Brodiaea Distribution Map

FIGURE 4-7

The following summarizes the size and distribution of thread-leaved brodiaea within RMV and identifies *major* and *important populations* and *key locations*:

- About 14-15 separate scattered locations occur in the Cristianitos sub-basin, ranging from one to 120 flowering stalks (No. 1 on Figure 4-7). These are *important populations* for conservation of the brodiaea in the subregion because they potentially provide connectivity between offsite locations to the south in San Onofre State Park and Camp Pendleton with planning area locations to the north (e.g., Chiquadora Ridge). These locations could also potentially link planning area locations to occurrences to the west including the Donna O'Neill Conservancy lands, ultimately linking to the offsite Talega Development and Forester Ranch development occurrences to be preserved in open space. In addition, they occur in an area dominated by clay soils, and thus there is an opportunity to expand the population in this area through adaptive management. Some subset of these locations comprise *key locations,* but there is flexibility in which locations need to be protected to maintain population viability in the area.

- A location with 2,000-3,000 flowering stalks occurs on the hill outcrop adjacent to the mine pits in the southern portion of Cristianitos Canyon on the boundary between the Cristianitos and Gabino and Blind Canyons sub-basins (No. 2 on Figure 4-7). As one of the two largest populations on RMV, this is a *major population* in a *key location.*

- Three small uncounted locations occur in the Talega sub-basin on the mesa east of TRW near the boundary with the Gabino and Blind canyons sub-basins and one occurs just southeast of the TRW facilities (No. 3 on Figure 4-7). Although presumed not to be large population, these locations may be considered an *important population* because they potentially contribute to connectivity and genetic exchange among the various nearby locations in the subregion.

- Five locations occur on Chiquadora Ridge southeast of the treatment plant, including the eastern portion of the Chiquita sub-basin and the western portion of the Gobernadora sub-basin (No. 4 on Figure 4-7). Four of the five locations appear to be small, but the eastern most location on the ridge has about 2,000 flowering stalks. These five locations together comprise a *major population* and one of the two largest on RMV. The largest location of this population also is in a *key location* for conservation of this species in the subregion because this location is on Chiquadora Ridge, a major landscape feature that serves an important habitat connection function, and it is the only *major population* in the San Juan Creek Watershed.

- One location of about 150 flowering stalks occurs on a slope east of Trabuco Creek in open space associated with the golf course project (No. 5 on Figure 4-7). This disjunct location is an *important population* because as the westernmost occurrence it contributes to the geographic diversity of the species in the subregion.

Other locations of thread-leaved brodiaea in the planning area include:

- The Forster Ranch population, which is a translocated/restored population. This population numbered about 5,000 flowering stalks in 2001. Only a few brodiaea flowered in 2002, attributed to the poor rainfall.

- One location (no size estimate) occurs on the Donna O'Neill Conservancy at Rancho Mission Viejo.

- Two locations where 100 and 150 plants were detected, respectively, occur within the planned Talega Development (USFWS 2001). These locations will be lost in association with the Talega Development, but corms excavated from these locations will be translocated to help offset this loss (USFWS 2001). Another location (no size estimate) occurs in designated Talega Open Space.

c. Protection Recommendations

Under the protection measures proposed for thread-leaved brodiaea in this section below, approximately 19 of the 25 discrete locations on RMV, or about 76 percent of the locations would be conserved. Conservation of the 19 locations accounts for approximately 4,290 to 5,290 counted flowering stalks of the approximately 4,490 to 5,490 counted flowering stalks on RMV, or approximately 96 percent of the counted flowering stalks. Presently there are no population estimates for uncounted brodiaea locations. However, four of the six uncounted locations would be conserved. Conservation of brodiaea would be achieved through implementation of the following measures:

- Protect the large population of approximately 2,000 flowering stalks of brodiaea on Chiquadora Ridge and two of the four small populations in Chiquita Canyon south of the wastewater treatment plant. Protection of these locations would constitute protection of a *major population* in a *key location*.

- Protect the location supporting approximately 2,000-3,000 flowering stalks on the hill outcrop adjacent to the clay mine pits in the southern portion of Cristianitos Canyon. This location meets the criteria for a *major population* in a *key location*.

- Protect 10 of the 14 small, scattered locations in Cristianitos Canyon, totaling approximately 300 flowering stalks. Maintain a continuous habitat connection between these scattered populations to allow for interactions and genetic exchange between the populations. These locations meet the criteria of *important populations* in *key locations* because they provide a linkage between brodiaea locations in the area and because the area has good potential for enhancement and restoration.

- Protect the three small (no counts available) locations in the Talega sub-basin east of the TRW facilities. The locations are considered *important populations* because they contribute to the geographic diversity and provide additional sources for genetic exchange and connectivity in this portion of the subregion.

- Protect the location of approximately 150 flowering stalks on the slope east of Trabuco Creek. This location is considered an *important population* because as the westmost occurrence in the subregion it contributes to the geographic diversity of the species in the subregion.

- Salvage and translocate individuals within development areas that cannot be avoided to areas with suitable soils. Where suitable soils are present, translocation sites should be located to the extent feasible and appropriate in key locations that maximize connectivity among locations within the subregion.

d. Management Recommendations

As part of the adaptive management program, the following management activities for thread-leaved brodiaea will be conducted:

- Control non-native invasive species such as cardoon, ryegrass, bromes and mustards.

- Manage grazing as part of the adaptive management program in a manner that optimizes the control of non-native grasses (*Lolium*, *Bromus, Avena*) while allowing for proliferation of the native grasses and forbs.

- Protect thread-leaved brodiaea populations from human disturbance such as hiking, mountain bikes and equestrian activities.

- Collect data on pollinators to ensure that habitats (including soils) for native Halictid bees and other pollinators are preserved in the vicinity of preserved populations.

e. Restoration Recommendations

- Translocate salvaged thread-leaved brodiaea to CSS and VGL restoration and enhancement areas where feasible and appropriate. Potential restoration and enhancement areas include Chiquita Ridge, Chiquadora Ridge, upper Cristianitos Canyon, Ladera Ranch open space adjacent to the Arroyo Trabuco golf course, upper Gabino Canyon, and Blind Canyon. Receiver areas should support clay soils suitable for brodiaea and, as noted above, should be placed in locations that maximize connectivity and genetic exchange.

- Salvage clay topsoils from development areas where feasible and appropriate and transport to restoration areas. Salvaged topsoils may be used to create additional suitable brodiaea habitat.

4.2 Unlisted Planning Species

4.2.1 Many-stemmed Dudleya

Dudleya multicaulis – Many-Stemmed Dudleya
Federal: None
State: None
CNPS: 1B

a. Regional Status

Many-stemmed dudleya is a small geophyte that grows in open-habitat soils associated with coastal sage scrub and grassland plant communities in southern California. It usually grows in shallow weathered cobbly loam or clay soils, and open barrens associated with rock outcrops and ridgelines.

The many-stemmed dudleya is endemic to southwestern California, and is known only from southeast Los Angeles County, Orange County, western Riverside County, extreme southwestern San Bernardino County, and the northernmost portion of San Diego County. Modern records have not substantiated old collections from near Tehachapi in Kern County, and in Dehesa Valley in southern San Diego County.

Orange County supports the majority of the known populations of this species and was estimated by Roberts to support much as 80 percent of the total dudleya in the species' range (Roberts 2000). Roberts identified five areas of dudleya concentration in Orange County: 1) the San Joaquin Hills; 2) the northern Lomas de Santiago including the Santiago Hills north to Gypsum and Blind Canyons (1 and 2 combined generally comprise the Orange County Central/Coastal Subregion); 3) the Rancho Mission Viejo (Southern Subregion); and 4) the northern portion of San Diego County that comprises Camp Pendleton (Roberts 1999). A fifth concentration has been identified in the Gavilan Hills (Estelle Mountain) of western Riverside County (Roberts 1999). Table 4-6 provides a region-wide summary of large and (potentially) important populations. Based on Table 4-6, it appears that Orange County (excluding the relatively small occurrences in the Cleveland National Forest) supports closer to 65 percent of the total dudleya.

TABLE 4-6
REGIONWIDE SUMMARY:
2002 STATUS OF MANY-STEMMED DUDLEYA
WITHIN KNOWN RANGE IN SOUTHERN CALIFORNIA

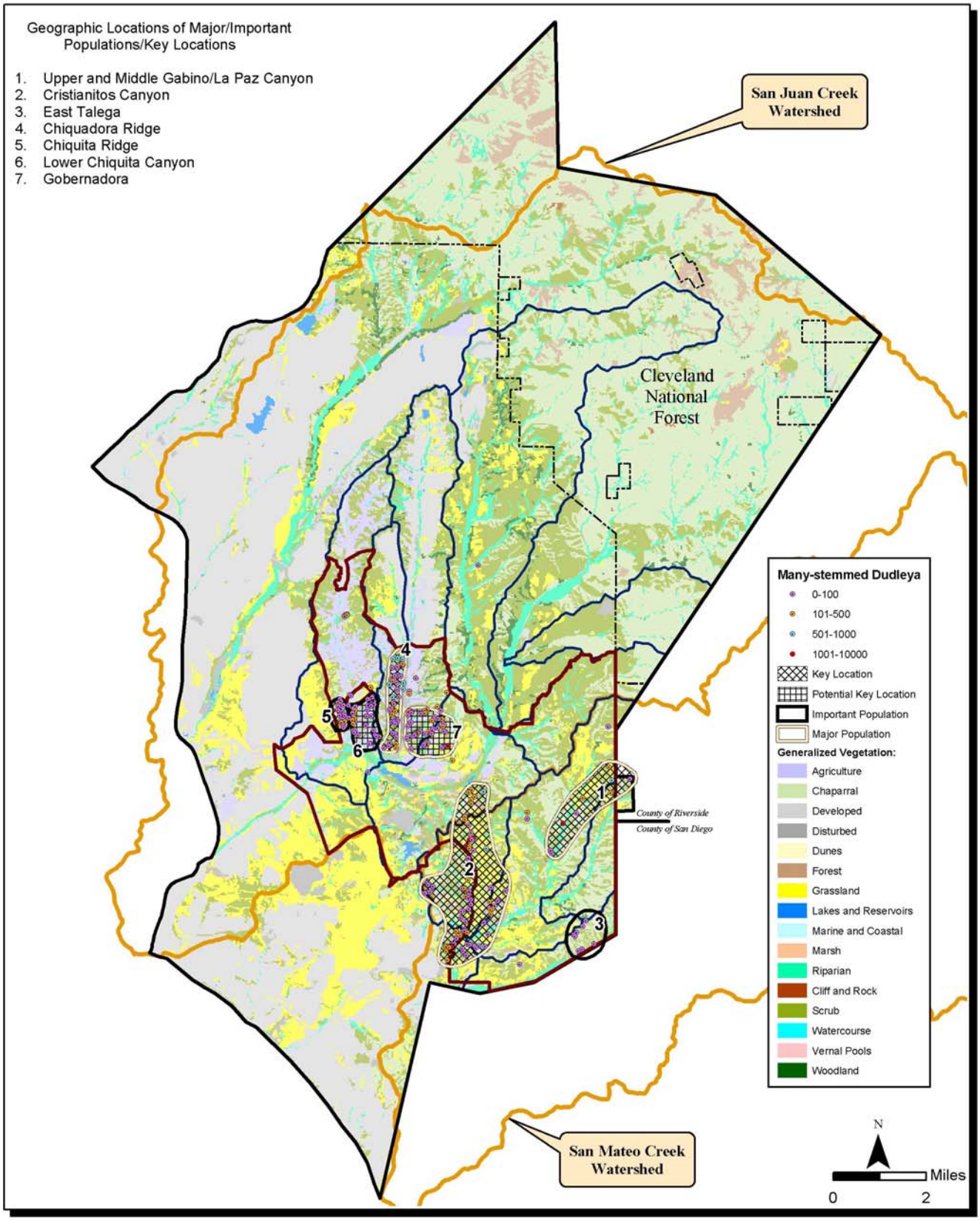
Regional Large Population Areas	Dudleya Population: Number of Counted/Estimated Plants
Rancho Mission Viejo and San Clemente	43,000
Central/Coastal NCCP Reserve Lands	52,000
Camp Pendleton, San Diego County	32,000
Estelle Mountain, Riverside County	10,000
Subtotal:	***137,000***
Other Significant Smaller Population Areas	
Corona, Alberhill, Cleveland National Forest Riverside County	4,486
Cleveland National Forest Orange and San Diego counties	1,938
San Dimas/San Jose Hills (mostly Bonelli Regional Park) Los Angeles County	2,459
Chino Hills, Orange County	150
Subtotal:	***9,033***
APPROXIMATE TOTAL PLANTS	**146,000**

The smaller populations listed in Table 4-6 do not necessarily include all potential *important populations* or *key locations* of the many-stemmed dudleya, because yet undiscovered plants may persist in small habitat fragments located outside of these areas. The preservation of these potential smaller *important populations* may also facilitate the survival and recovery of this rare species. Delineation and identification of other smaller populations is beyond the scope of this analysis.

b. Subregional Status

Many-stemmed dudleya is known from five main areas in the planning area (Figure 4-8): Chiquita Ridge; Chiquadora Ridge; Gobernadora/Central San Juan east of Gobernadora Creek and north of ColorSpot Nursery; Trampas Canyon/Cristianitos Canyon extending south to the Talega development in the San Clemente Watershed; and upper Gabino and La Paz canyons. A smaller cluster occurs east of the TRW facilities on the mesa. There also is a single record for the Bell Canyon area on Starr Ranch (F. Roberts 1997) and locations in Caspers Wilderness Park not in the data base, but these populations are considered to be small. The total counted individuals of many-stemmed dudleya numbers in the planning area about 43,000.

Within the planning area, this species occurs in open coastal sage scrub or sage scrub/grassland ecotones dominated by *Salvia apiana*, *Galium angustifolium*, *Bothriochloa barbinodis*, *Castilleja*



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Many-stemmed Dudleya Distribution Map

FIGURE 4-8

foliolosa, *Aristida hamulosa*, and *Artemisia californica*. In some areas, such as ridges east of Gobernadora and north of ColorSpot Nursery, this species is associated with Cieneba sandstone outcrops that support low densities of *Galium angustifolium*, *Bothriochloa barbinodis*, and *Castilleja foliolosa*. At other locations, such as portions of Chiquadora Ridge and Cristianitos, many-stemmed dudleya is often associated with purple needlegrass grassland and clay outcrops within the grassland complexes. In most of these areas, the dudleya typically grows in the shade of larger grasses or shrubs that appear to provide at least limited "nursery" effects.

The following describes the *major* and *important populations* and *key locations* of many-stemmed dudleya in the planning area:

- Upper Gabino/Middle Gabino and upper La Paz Canyon support several locations ranging from about five individuals to about 1,500 individuals, cumulatively totaling more than 3,500 individuals (No. 1 on Figure 4-8). Six of the locations range from about 100-700 individuals, with one location at the boundary between middle and upper Gabino supporting about 1,500 individuals. Two locations near the county boundary with Riverside number about 500 and 700 individuals each, the latter of which overlaps the boundary with the La Paz Canyon sub-basin. These locations comprise a *major population* in a *key location*.

- A *major population* is located in the Cristianitos sub-basin and the southern portion of the Trampas Canyon sub-basin extending, south to the Talega development in the San Clemente Watershed and eastward into the western portion of the Lower Gabino and Blind canyon sub-basins (No. 2 on Figure 4-8). This population occurs on both RMV land and the Donna O'Neill Conservancy at Rancho Mission Viejo and extends into Talega Open Space, as described below.

    - Cristianitos Canyon outside the Donna O'Neill Conservancy at Rancho Mission Viejo supports about 14 locations ranging up to 1,800 individuals. Three locations number 1,100, 1,500 and 1,800 individuals, respectively. These locations comprise three of the seven largest populations known from the planning area. Five of the locations range from about 200 to 762 individuals. The associated locations in southern Trampas Canyon include about 9 locations of 20-700 individuals, with five of these numbering 200-700 individuals. The cumulative total of these locations is more than 10,300 individuals, or about 24 percent of the counted dudleya in the subregion. These locations comprise a *major population* in a *key location.*

    - The Donna O'Neill Land Conservancy supports about 40 locations, with two of the locations supporting about 2,000 individuals each. The cumulative total of dudleya on the Conservancy is about 8,500 individuals. These locations are part of the Cristianitos *major population*.

- The western portion of lower Gabino and Blind canyons supports several small locations, with one location numbering about 400 individuals. These locations are physically associated with the Cristianitos sub-basin population and together with these locations form a *major population*.

- Eight locations are known from Talega Canyon east of TRW, but population estimates were not made (No. 3 on Figure 4-8) (these were anecdotal observations by DUDEK during 1994 focused gnatcatcher surveys). An additional location occurs just southeast of the TRW facility. Although population estimates are not available, the eight locations may be considered an *important population* because they contribute to geographic diversity in the subregion and potentially provide a connection with nearby populations on Camp Pendleton. Additional surveys should be conducted to assess the status of the populations southeast of the TRW facility.

- Chiquadora Ridge, including the area within the Gobernadora sub-basin, supports about 50 discrete locations ranging up to 750 individuals (No. 4 on Figure 4-8). Most of these patches do not have population estimates, but are assumed to be smaller than 750 individuals based on the occupied habitat polygon sizes mapped. The cumulative total of many-stemmed dudleya on Chiquadora Ridge is approximately 9,600 individuals. These locations comprise a *major population* in a *key location* because the ridge is a major landscape feature in the planning area that provides important habitat connectivity functions.

- Chiquita Ridge west of the creek supports about 35 discrete locations ranging up to about 420 individuals, with seven locations supporting more than 100 individuals (No. 5 on Figure 4-8). The cumulative total of these locations is about 2,430 individuals. While perhaps not being large enough to constitute a *major population*, these locations do comprise an *important population* in a *key location* because of their clustering on Chiquita Ridge, a major landscape feature in the planning area that provides important habitat connectivity function.

- Lower Chiquita Canyon east of the creek and south of the treatment plant supports about 41 discrete locations totaling about 1,600 individuals (No. 6 on Figure 4-8). This population probably is not large enough to constitute a *major population*. Whether it can be considered an *important population* and a *key location* depends on the protection status of the Chiquita Ridge and Chiquadora Ridge populations. The two latter populations are larger and have less fragmentation and probably are more likely to remain viable in the long-term.

- Middle Chiquita Canyon (between the treatment plant and Oso Parkway) supports a few scattered locations in association with intermediate mariposa lily in the area between the Narrows and Tesoro High School. Because these locations are small and apparently do

not serve a linkage function between other larger populations, they do not comprise an *important population.*

- Gobernadora sub-basin east of the creek supports about 35 scattered locations ranging from the 10s to 310 individuals (No. 7 on Figure 4-8). Central San Juan Creek sub-basin north of the creek supports about 20 locations that generally are contiguous with the Gobernadora locations (i.e., they are part of the same population). These locations range up to about 2,000 individuals, but the median population size is much smaller at 50 individuals; 13 locations number 11-95 individuals and five number 100-345 individuals. Combined, these locations total more than 5,600 individuals and comprise a *major population.* Whether this population is in a *key location* should be considered in the context of the conservation status of the other *major* and *important populations* in the San Juan Creek Watershed, as discussed in the next section.

b. Protection Recommendations

Under the protection measures proposed below in this section, approximately 174 (65 percent) of the approximately 269 discrete mapped many-stemmed dudleya locations and approximately 35,040 (81 percent) of the estimated 42,980 counted individuals in the planning area would be conserved. Furthermore, implementation of the protection measures would result in conservation of four of the six *major populations* in the planning area: Chiquita Ridge; Chiquadora Ridge; Trampas Canyon/Cristianitos Canyon; and Upper Gabino Canyon/La Paz Canyon. Two of these populations are in the San Juan Creek Watershed and the other two primarily are in the San Mateo Creek Watershed, with some overlap into the San Clemente Watershed. These *major populations* also serve as *key locations* in the Southern Subregion. With the protection of four of the six *major populations* in two different watersheds, the key localities are protected. This conservation level would be achieved through implementation of the following protection recommendations:

- Protect the Chiquita Ridge *important population* and *key location* totaling about 2,430 individuals in approximately 35 discrete locations. This population includes seven locations totaling 100 to 420 individuals each.

- Protect the Chiquadora Ridge *major population* totaling about 9,580 individuals in approximately 52 discrete locations. This population includes 24 locations totaling 100 to 750 individuals each, with nine of these locations numbering more than 500 individuals.

- Protect the *major population* extending from the southern portion of the Trampas Canyon sub-basin in the north, through the Cristianitos Canyon sub-basin south to the Talega development open space located in the San Clemente Watershed. This area supports the largest *major population* in the subregion with approximately 19,300 individuals in about 69 discrete locations. About 40 of the 69 locations totaling about 8,500 individuals are

already conserved within the Donna O'Neill Conservancy at Rancho Mission Viejo and Talega open space (including two locations of about 2,000 individuals each). Seven of the locations in this population on RMV number 500 individuals or more, and the three largest populations are about 1,100, 1,500 and 1,800 individuals each. Although a few small locations of dudleya may be impacted in the Cristianitos and lower Gabino and Blind Canyons sub-basins (3 locations totaling approximately 70 individuals), the loss of the locations would not adversely affect the viability of this *major population*.

- Protect the Gabino and Blind Canyon/La Paz Canyon *major population* totaling about 3,500 individuals in approximately 16 locations. This population includes nine locations of 100 to 1,500 individuals.

- Maintain direct habitat connectivity between the remaining major populations to convey pollinators and allow for dispersal.

- Salvage and translocate all individuals from development areas, as feasible and appropriate, where impacts cannot be avoided.

d. Management Recommendations

As part of the adaptive management program, the following management activities for many-stemmed dudleya will be conducted:

- Control non-native invasive species such as cardoon, ryegrass, bromes, smooth cat's-ear (*Hypocharis glabra*), Crete hedypnois (*Hedypnois cretica*), and mustards.

- Manage grazing as part of the adaptive management program in a manner that optimizes the control of non-native grasses (*Lolium*, *Bromus, Avena*) while allowing for proliferation of the native grasses and forbs.

- Protect many-stemmed dudleya populations from human disturbance such as hiking, mountain bikes and equestrian activities.

e. Restoration Recommendations

Translocation of many-stemmed dudleya has been demonstrated to be successful (e.g., the San Joaquin Hills Tollroad [SR-73]) and thus is recommended for as measure for mitigating impacts to dudleya, as described below:

- Translocate salvaged many-stemmed dudleya to CSS and VGL restoration and enhancement areas where feasible and appropriate. Potential restoration and enhancement areas include Chiquita Ridge, Chiquadora Ridge, upper Cristianitos Canyon, upper Gabino Canyon, Blind Canyon, and the Radio Tower Road area (although

there are no documented locations along Radio Tower Road, the area supports clay soils that might be suitable for the dudleya). Receiver areas should support clay, cobbly loam, or sandy clay loam soils suitable for many-stemmed dudleya.

- Salvage suitable topsoils from development areas where feasible and appropriate and transport to restoration areas. Salvaged topsoils may be used to create suitable many-stemmed dudleya habitat and may contain seed bank.

4.2.2 Intermediate Mariposa Lily

Calochortus weedii var. *intermedius* – Intermediate Mariposa Lily
Federal: None
State: None
CNPS: 1B

a. Regional Status

The intermediate mariposa lily is a perennial geophyte in the lily family (Liliaceae) that occurs in coastal sage scrub, chaparral and grassland/scrub ecotones. Stems heights are variable, reaching to 0.8 to 2.0 m (M. Elvin, pers. obs.). The plant typically produces from 3 to 4 campanulate flowers ranging from 2.5 to 3 cm long. The petals are broadly cuneate-obovate and light yellow tinged (sometimes with purple) and usually fringed with yellow hairs. The intermediate mariposa lily is distinguished from *C. w. weedii* by petal shape and color with bright yellow petals on *C. w. weedii,* and from C. *w. vestus* by the abruptly pointed anthers on C. *w. vestus*.

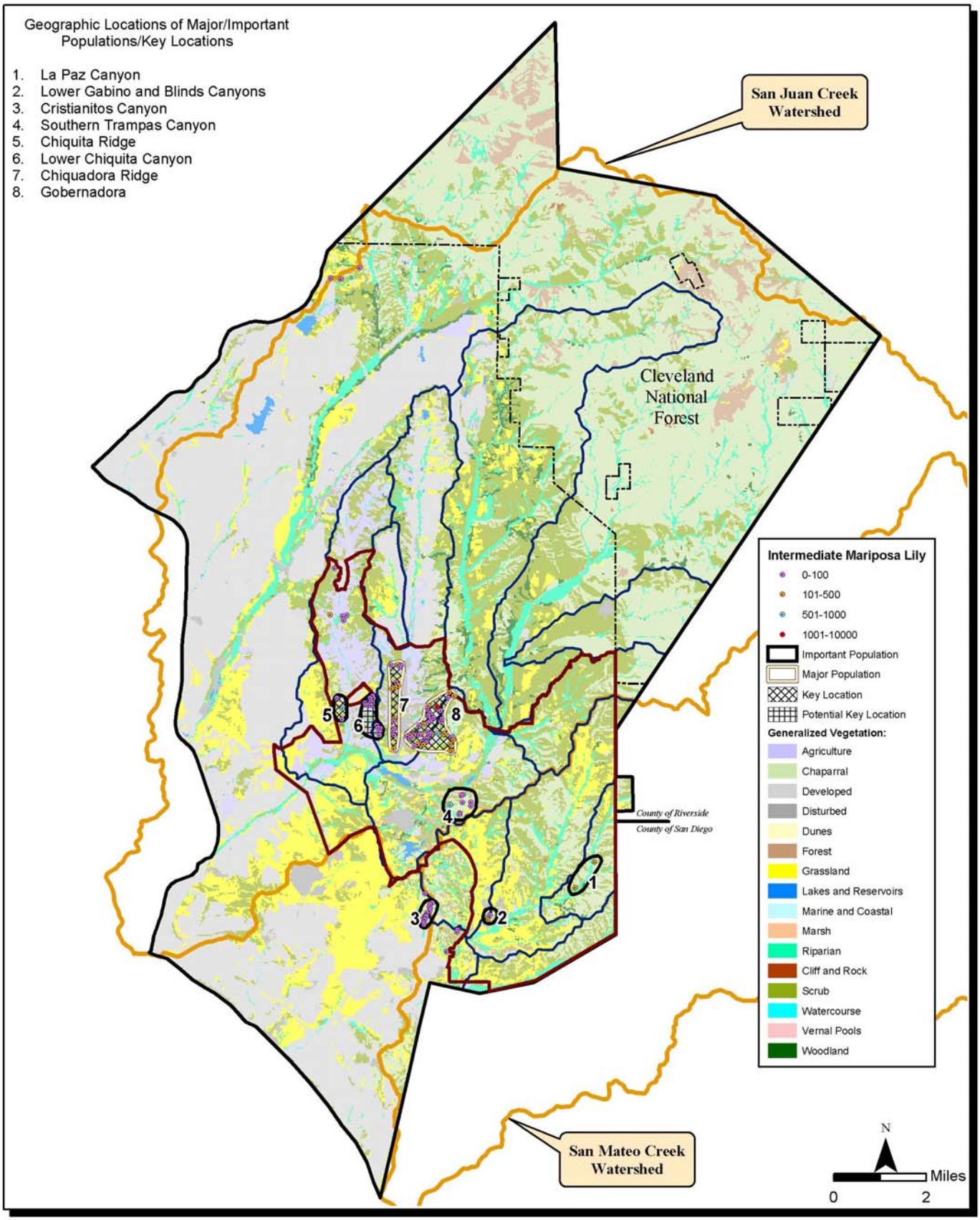
The intermediate mariposa lily is known from Orange, Riverside and Los Angeles counties and at least one putative occurrence in Ventura County.

In Riverside County, occurrences are known from the Winchester quadrangle, in the hills west of Crown Valley and northwest of Rawson Canyon; the Vail Lake Quadrangle approximately one-half mile southwest of Vail Lake dam; the Corona South near the mouth of Hagadoor Canyon.

Orange County supports the majority of the extant populations with significant populations found in the Central/Coastal Subregion. Up to 83,000 individuals are reported from the Central/Coastal Subregion, including approximately 46,535 from within the NCCP Reserve and 6,209 in the North Ranch Policy Plan Area that is also dedicated open space. The Southern Subregion supports about 12,800 individuals, or about 12 percent of the known individuals in the County.

b. Subregional Status

Intermediate mariposa lily generally occurs in four main areas on RMV (Figure 4-9): Chiquita Canyon/Chiquadora Ridge, Gobernadora east of the creek/northern Central San Juan Creek



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Intermediate Mariposa Lily Distribution Map

FIGURE 4-9

sub-basin, Cristianitos Canyon/southern Trampas Canyon sub-basin, and La Paz Canyon. A few scattered locations also occur in the Foothill-Trabuco Specific Plan area on the Saddleback Meadows site. Except for the La Paz Canyon and Saddleback Meadows locations, this species tends to occur in association with many-stemmed dudleya in the planning area. A total of about 130 locations are known from the planning area with about 12,800 counted individuals. Of the 130 locations, approximately 111 (85 percent) are on RMV land.

Within the subregion this species is most often found growing under or through shrubs in open coastal sage scrub associated with Cieneba sandstone outcrops or Cieneba sandy loams within the Santiago geologic formations. In other limited areas, this species is associated with cobbly loams or clay loams that support coastal sage scrub or chamise chaparral.

The following describes the *major* and *important populations* and *key locations* of the intermediate mariposa lily in the planning area:

- La Paz Canyon supports two locations of about 322 and 485 individuals, respectively (No. 1 on Figure 4-9). These locations may be considered *important populations* because they contribute to the geographic diversity of the species in the subregion.

- Lower Gabino/Blind canyons support two locations of about 12 and 305 individuals, respectively (No. 2 on Figure 4-9). These locations are on the southern boundary with Cristianitos Canyon. These locations may be considered *important populations* because they contribute to the geographic diversity of the species in the subregion.

- Cristianitos Canyon within the Donna O'Neill Land Conservancy supports five locations of unknown size (data base has population size of 1) (No. 3 on Figure 4-9). In addition, about 15 locations occur west and south of the Cristianitos sub-basin contiguous with these five locations in Talega Development Open Space, with the largest population at 17 individuals. These combined locations may be considered an *important population* because they contribute to the geographic diversity of the species in the subregion.

- The southern edge of the Trampas Canyon sub-basin supports eight locations, with one population numbering 640 individuals, but the others numbering less than 50 individuals (No. 4 on Figure 4-9). These locations may be considered an *important population* because they contribute to the geographic diversity of the species in the subregion.

- Lower Chiquita Ridge west of the creek supports three locations numbering about 21, 47, and 625 individuals (No. 5 on Figure 4-9). Although these locations do not support large populations, together they may be considered to an *important population* in a *key location* because Chiquita Ridge is a key landscape feature and habitat linkage in the subregion.

- Lower Chiquita Canyon east of the creek and south of the treatment plant supports about 18 locations, with most uncounted, but one relatively large population of 660 individuals

(No. 6 on Figure 4-9). These scattered locations, along with the location numbering 660 individuals, may be considered an *important population.* Whether this population is also in a *key location* depends of the protection status of the Chiquita Ridge and Chiquadora Ridge populations, as described in the next section.

- Middle Chiquita Canyon supports five scattered locations north of the Narrows and both east and west of the creek. The largest of the five locations is about 260 individuals. Two locations north of Oso Parkway occur in the Upper Chiquita Conservation Easement, with one location supporting only one individual and the other supporting ten individuals. Because of the few number of locations and the small number of individuals at each, these locations probably are not *important populations* or in *key locations*.

- Chiquadora Ridge supports about 14 locations totaling about 2,000 individuals (No. 7 on Figure 4-9). These locations constitute a *major population* in a *key location* because Chiquadora Ridge is a key landscape feature in the subregion and serves an important habitat connection function.

- Gobernadora sub-basin east of the creek and the northern portion of the Central San Juan Creek sub-basin supports more than 50 locations, with eight locations numbering more than 200 individuals and the two largest locations 775 and 1,300 individuals each (No. 8 on Figure 4-9). This area supports a total of about 6,600 individuals, or about 51 percent of the individuals in the subregion and about 6 percent of the population in Orange County. The location supporting 1,300 individuals is the single largest population in the subregion. These locations comprise a *major population* in a *key location*.

c. Protection Recommendations

The protection measures proposed in the section below would result in the conservation of about 60 of the 130 known locations of intermediate mariposa lily (46 percent) and about 6,080 of the 12,800 known individuals (47 percent). Because the *major population* in the Gobernadora area is proposed for development under several of the current Reserve/Open Space alternatives, an important component of the conservation and management strategy will be propagation of new individuals and translocation of existing plants from developed areas, as implemented in the adaptive management program. This level of conservation would be achieved through the following specific protection measures:

- Protect approximately six locations along Chiquita Ridge, along with the location south of the treatment plant that supports 660 individuals, totally protection for about 1,600 individuals. Although these locations are scattered, together they comprise an *important population* in a *key location*.

- Protect the 14 locations comprising the *major population* on Chiquadora Ridge, for total protection of about 2,000 individuals.

- Protect two locations in the eastern portion of the Gobernadora sub-basin of 315 and 135 individuals each.

- Protect all known locations of intermediate mariposa lily in the San Mateo Watershed, totaling about 18 locations and more than 2,300 individuals.

- Salvage and translocate intermediate mariposa lily to the extent feasible and appropriate, as described below under Restoration Recommendations.

d. Management Recommendations

As part of the adaptive management program, the following management activities for intermediate mariposa lily will be conducted:

- Control non-native invasive species such as cardoon, ryegrass, and mustards.

- Manage grazing in a manner that optimizes the control of non-native grasses (*Lolium*, *Bromus, Avena*) while allowing for proliferation of the native grasses and forbs. The optimum grazing pattern has not been established and will be part of the adaptive management program.

- Conduct prescribed burning where appropriate and as described in the Fire Management Program.

- Protect intermediate mariposa lily populations from human disturbance such as hiking, mountain bikes and equestrian activities.

e. Restoration Recommendations

- Translocate salvaged intermediate mariposa lily to areas where suitable soil conditions occur. Specific translocation areas have not been identified, but based on the existing distribution, potential general translocation areas include Chiquita Ridge, Chiquadora Ridge, upper Cristianitos Canyon, La Paz Canyon.

- Initiate a seed collection program in 2003 if sufficient rain falls to warrant the collection program. Receiver sites should be identified in the winter of 2003 and a pilot program should be implemented to determine the effectiveness of propagation from seed.

4.2.3 Southern Tarplant

Centromadia parryi var. *australis* – Southern Tarplant
Federal: None
State: None
CNPS: 1B

a. Regional Status

Southern tarplant is an annual member of the sunflower family (Asteraceae) that occurs in vernal pools, alkali playas, alkali grasslands, and disturbed areas. The stiff bristly stems are simple or branched and can reach heights of up to 0.7 m. The lower leaves vary from 5 to 20 cm, and are linear-lanceolate and deeply divided. The upper leaves are linear and are spine-tipped. The infloresence can vary from open to dense. The ray flowers number from 9 to more than 30 and the ligule is 2 to 6 mm, 2 lobed, and yellow (sometimes becoming red). The species is characterized by many disk flowers with yellow corollas and brown or black anthers.

Historically this species was known from 47 locations in San Diego, Orange, Los Angeles, Ventura and Santa Barbara counties, with four populations reported from Mexico.[2] Of the approximately 47 populations in the U.S., between 35 and 40 percent have been extirpated. Currently, Orange County contains the majority of the remaining populations (Table 4-7). In his status report, Roberts divided the populations into: "major" – over 8,000; "moderate" – between 1,000 and 5,000; and "small" – fewer than 1,000. Nine populations are reported by Roberts as moderate (over 1,000) and two populations, Talbert Marsh and Canada Chiquita are reported as major.

Of the extant populations, many are on protected lands, including the populations at Newport Ecological Reserve (estimated at 160,000 individuals by DuBois in 2002, pers. comm. 2002; this estimate is subject to field conformation to be completed by T. Bomkamp), Hellman Ranch (now in permanent conservation) (3,307 individuals recorded in 1996), Bolsa Chica Mesa (estimated 2,000 individuals in conservation/preservation areas based on surveys by LSA in 2001), Talbert Park (8,000+), Madrona Marsh, Banning Ranch (2,000+ individuals in 1999 recorded by GLA). Also, not included by Roberts are 11,000+ individuals in the Chiquita Tesoro Mitigation Site and an estimated 10,000+ individuals in the Ladera portion of the GERA mitigation area, both of which would be considered as "major" populations based upon the Roberts' convention.

[2] Much of the information regarding status of the southern tarplant has been obtained from a report prepared by Fred Roberts for the Bolsa Chica Land Trust in 2000, entitled *Southern Tarplant (Hemizonia parryi ssp. australis) on the Bolsa Chica Mesa, Orange County, California.* This report was submitted to the Coastal Commission and is part of the public record for the Bolsa Chica project.

TABLE 4-7
REGIONWIDE SUMMARY:
2002 STATUS OF SOUTHERN TARPLANT
WITHIN KNOWN RANGE IN SOUTHERN CALIFORNIA

Regional Major Population Area(s) in Orange County	Southern Tarplant Population: Number of Counted/Estimated Plants
Rancho Mission Viejo	130,000
Newport Backbay	Estimated 160,000*
Talbert Park	8,000
Banning Ranch	2,000+
Hellman Ranch	3,300
Bolsa Chica	2,000+
Subtotal:	***305,000***
Other Important Populations	
Madrona Marsh, Los Angeles County	Estimated 1,000 to 5,000
APPROXIMATE TOTAL PLANTS	**310,000**

Notes:

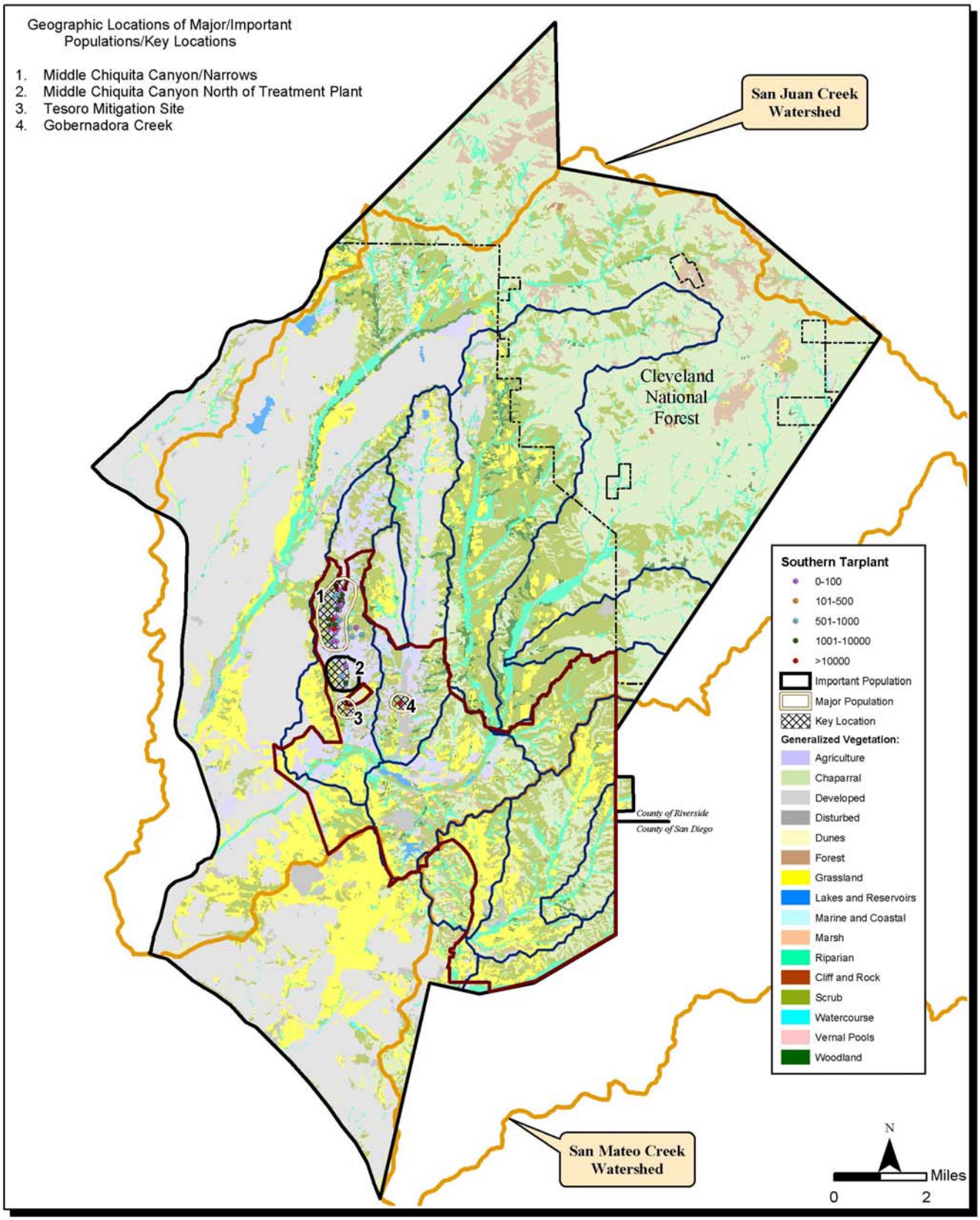
* The Newport Backbay population is a preliminary rough estimate and is subject to field verification by T. Bomkamp.

b. Subregional Status

Southern tarplant is limited to two sub-basins in the planning area (Figure 4-10). The largest population is in Chiquita Canyon and, including the Tesoro mitigation site, numbers more than 120,000 individuals. A large population numbering 10,000+ individuals occurs on the GERA site in Gobernadora. It should be noted that southern tarplant populations are quite variable in size and location from year to year.

Within the subregion, this species is typically associated with wet meadow areas that exhibit mildly alkaline/saline soils dominated by saltgrass (*Distichlis spicata*), Mexican rush (*Juncus mexicanus*), yerba mansa (*Anemopsis californica*), shining peppergrass (*Lepidium nitidum*), dwarf peppergrass (*Lepidium latipes*), and alkali plantain (*Plantago elongata*). In Chiquita Canyon this species is sometimes associated with or in close proximity to Coulter's saltbush. More than any of the other special-status plant species under consideration, this species is well adapted to disturbance associated with flood events and appears to benefit from occasional disking or other soil-disturbing activities.

The following provides a more detailed description of the southern tarplant in the planning area and identifies *major* and *important populations*:



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Southern Tarplant Distribution Map

FIGURE 4-10

- Middle Chiquita north and south of the "Narrows" supports about 35 mapped locations ranging up to about 30,000 individuals in the largest (No. 1 on Figure 4-10). Estimated discrete locations numbering 7,000, 7,500, 10,000, 20,000, and 30,000 individuals, respectively, are located west of the creek. Locations east of the creek are more disparate and smaller, with the largest numbering about 750 individuals. This is a *major population* and the portion of the population west of the creek is a *key location*.

- Middle Chiquita northwest of the wastewater treatment facility supports three locations west of the creek numbering 3,000, 700 and 40 individuals, respectively (No. 2 on Figure 4-10). These locations comprise an *important population* in a *key location*.

- The Tesoro High School mitigation site in Lower Chiquita supported approximately 1,100 individual in 2000, 6,000 individuals in 2001 and 11,000 individuals in 2002 as determined during monitoring of the population (No. 3 on Figure 4-10). This population was introduced to the site in Fall of 1999 as mitigation for impacts to the tarplant at the High School site. This population appears to be self-sustaining and has increased for three consecutive years and should now be considered a *major population* in a *key location*.

- Further south in lower Chiquita Canyon there is one population numbering about 400 individuals. This population is relatively small for this species, but should be considered part of the Tesoro mitigation site *major population*.

- Portions of the Ladera Ranch Mitigation site in GERA, on the west side of the Gobernadora Creek "spur" that enters the mitigation area, supports an estimated 10,000+ individuals that have colonized the mitigation areas (No. 4 on Figure 4-10). This population should now be considered a *major population* in a *key location*.

- Finally, a wetland seep between Gobernadora and Chiquita supports a few hundred individuals during optimal years. While not large enough to be considered a major population, this population may potentially be an *important population* in a *key location.*

c. Protection Recommendations

- Minimize impacts to the *key location* of southern tarplant west of Chiquita Creek in Middle Chiquita Canyon to the maximum extent feasible. Minimize impacts to the remainder of the *major population* in Middle Chiquita Canyon. Mitigate impacts to southern tarplant in a manner similar to the Tesoro mitigation project (ongoing mitigation projects in Chiquita Canyon have demonstrated over three successive years that this plant can be readily propagated from seed).

- Protect the *major population* of southern tarplant in a *key location* in Lower Chiquita Canyon.

- Protect the *major population* of southern tarplant totaling 10,000+ individuals located in GERA.

d. Management Recommendations

- Implement a management program for southern tarplant, including control of non-native invasive species, management of grazing and minimization of human access and disturbance as part of the adaptive management program**.**

e. Restoration Recommendations

- Translocate salvaged southern tarplant to suitable restoration and enhancement areas in the Chiquita sub-basin. Receiver areas should support alkali soils suitable for the species and should be placed in locations that maximize connectivity and genetic exchange.

4.2.4 Coulter's Saltbush

Atriplex coulteri – Coulter's Saltbush
Federal: None
State: None
CNPS: List 1B

a. Regional Status

Coulter's saltbush is a decumbent to ascending perennial growing to 0.5 m in length. This species occurs on coastal bluffs and on alkali or saline flats in interior areas such as western Riverside County. The leaves are subsessile, elliptic to lanceolate, somewhat greenish, sparsely fine-scaly and detate. The blades are 7-20 mm in length. The plants are monecious (male and female flowers on the same plant) with the inconspicuous female flowers subtended by bracts and the male flowers in panicles. The seeds are found within a fruiting bract, which in this species is sharply dentate, 2-3 mm long, and with small tubercles (sometimes smooth) covering the surface of the bract.

This species occurs from Baja California, extending northward to Ventura County and also on the Channel Islands. Extant locations on the mainland include: Rancho Mission Viejo (approximately 3,000 plants); San Clemente State Park; San Onofre State Park; Whispering Hills in San Juan Capistrano; Dana Point Headlands; Bommer Canyon (two small populations of about 20 plants each); San Joaquin Freshwater Marsh (less than 25 plants observed); Laguna Beach; MacArthur Boulevard and Pacific Coast Highway; behind Newport Beach Public Library (observed by Dave Bramlet in 1998); Pelican Hill; and the east slope above Los Trancos Canyon, where it is common along the dirt road passing through coastal sage scrub on hill top in sandy clay soil.

b. Subregional Status

Coulter's saltbush is known from three general locations in the planning area (Figure 4-11): Chiquita Canyon, upper Cristianitos Canyon and upper Gabino Canyon. Coulter's saltbush occurs in alkaline soils and is associated with southern tarplant in Chiquita Canyon. Because this species is relatively rare within its range, all populations on Rancho Mission Viejo constitute *major* or *important populations*. Specific occurrences are described below.

- In upper Gabino Canyon a small population of about 100 individuals occurs west of and adjacent to the creek (No. 1 on Figure 4-11). This is an *important population* because of the rarity of this species in the region.

- Upper Cristianitos Creek supports two small locations numbering three and 12 individuals, respectively (No. 2 on Figure 4-11). This is an *important population* because of the rarity of this species in the region.

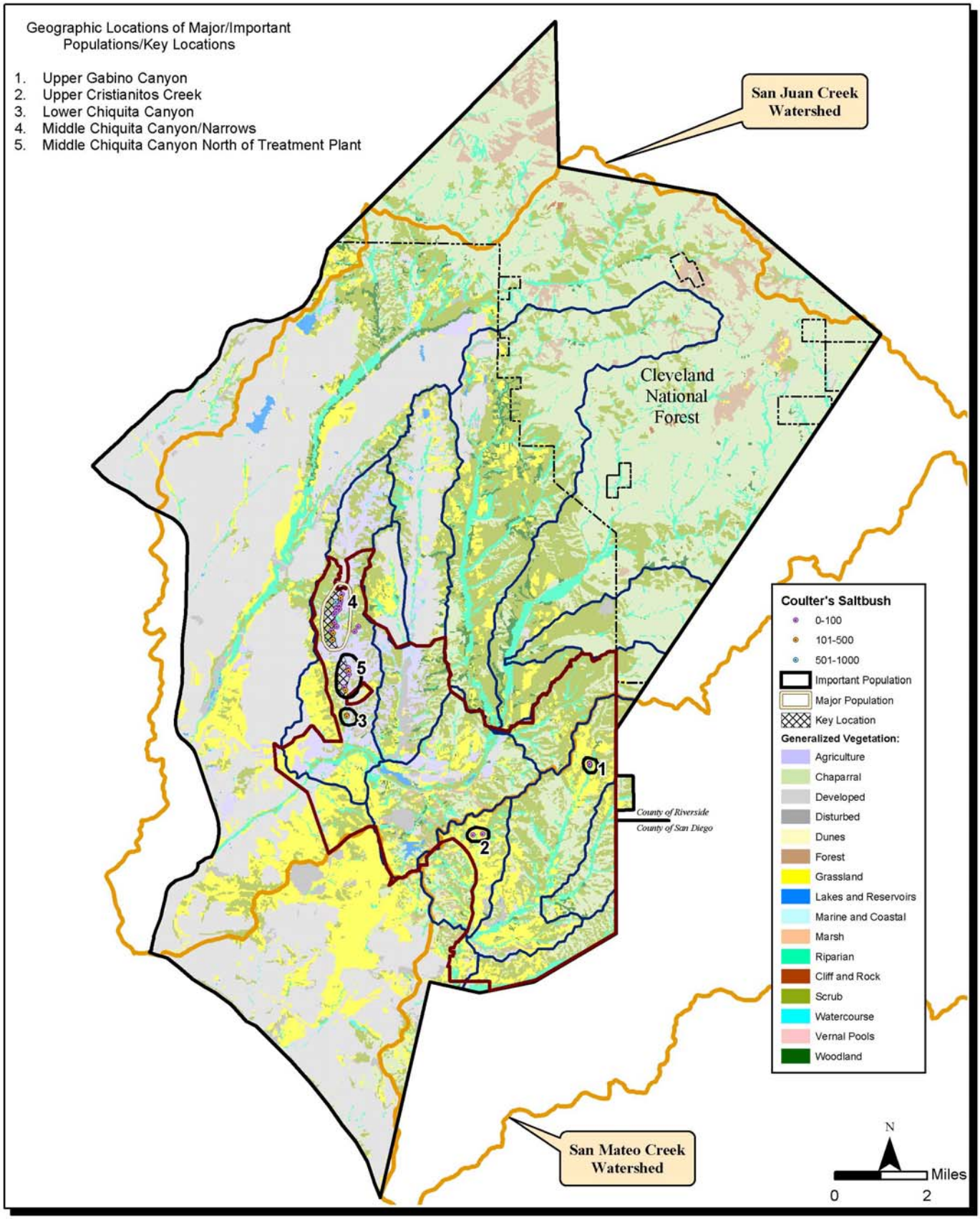
- Lower Chiquita Canyon west of the creek supports two locations numbering 200 and 400 individuals, respectively (No. 3 on Figure 4-11). This is an *important population* because of the rarity of this species in the region.

- Middle Chiquita just above and below the Narrows supports numerous locations ranging from the 10s to 600 individuals (No. 4 on Figure 4-11). The location with 600 individuals is east and adjacent to the creek about midway between the Narrows and Tesoro High School. Locations with 150, 150 and 200 individuals are west of the creek. This location overlaps substantially with the largest southern tarplant population. This group of locations east and west of the creek is a *major population* in a *key location*.

- Middle Chiquita just to the northwest of the treatment plant supports five locations, of which four are west of the creek (No. 5 on Figure 4-11). The locations west of the creek number 25, 50, 150 and 360 individuals, and the location east of the creek has 100 individuals. These five locations constitute an *important population*. The locations west of the creek constitute a *key location*.

- Two small locations are located in a major side canyon southeast of the Narrows. These locations number six and 10 individuals, respectively.

- One small population of less than 20 individuals occurs with southern tarplant (noted above) at a wetland seep between Gobernadora and Chiquita.



Draft NCCP/HCP Planning Guidelines

Coulter's Saltbush Distribution Map

FIGURE 4-11

c. Protection Recommendations

- Protect the *key locations* of Coulter's saltbush in Middle and Lower Chiquita Canyon. Minimize impacts to *important populations* within the sub-basin and mitigate unavoidable impacts in the sub-basin.

- Protect the two known *important populations* of Coulter's saltbush in the Cristianitos sub-basin.

- Protect the *important population* of Coulter's saltbush in the Upper Gabino Canyon subunit.

d. Management Recommendations

- Implement a management program for Coulter's saltbush, including control of non-native invasive species, management of grazing and minimization of human access and disturbance as part of the adaptive management program**.**

e. Restoration Recommendations

- Translocate salvaged Coulter's saltbush to suitable restoration and enhancement areas in the same sub-basin as where impacts occur to the extent feasible. Receiver areas should support alkali soils suitable for the species and should be placed in locations that maximize connectivity and genetic exchange.

4.2.5 Mud Nama

Nama stenocarpum – Mud Nama
Federal: None
State: None
CNPS: List 2

a. Regional Status

Mud nama is a prostrate to ascending annual with short soft silky hairs, short glandular hairs, and some stiff hairs that are swollen at the base. The leaves vary from 5-30 mm and are typically oblanceolate or spoon shaped with wavy margins and rolled edges. The flowers are white to cream and the corolla is funnel shaped and 4-6 mm long.

This species occurs in vernally wet areas including vernal pools, the drying margins of lakes and ponds, and other intermittently wet areas. Historically in California, this species was known from Los Angeles, Orange, San Diego, Riverside and Imperial counties, across the desert through the southwestern U.S. to Texas and into Mexico. This species is also known from San

Clemente Island. This species is believed to be extirpated from Los Angeles and Imperial counties and there were no recent records from Riverside County and Orange County. However, this species was identified in a vernal pool at Fairview Park in Costa Mesa in 1996, and at the Chiquita Ridge vernal pool in 1997. Two other populations have been identified on Rancho Mission Viejo since that time, one along the edge of a stockpond near the O'Neill residence and the other along the edge of a stock pond between Cristianitos and Trampas canyons. A large population consisting of thousands of plants was also recently discovered at Mystic Lake along the San Jacinto River and another Orange County population was identified at the Lambert Reservoir in Central Orange County.

b. Subregional Status

As noted above, there are three occurrences known from RMV (Figure 4-12), including the 1.2-acre vernal pool on Chiquita Ridge, along the margins of a stock pond immediately west of a Ranch residence south of Ortega Highway, and from the margins of a stock pond between Cristianitos and Trampas canyons south of Ortega Highway (note: only one of the three occurrences currently is depicted on the map; precise locations for the other two locations are being field-verified and still need to be entered into the data base). The Rancho Mission Viejo populations vary considerably in size from year to year based upon rainfall. In dry years they may not appear at all and in wet years they number in the tens or hundreds.[3] Because the mud nama is so rare, all populations on RMV are *important populations* in *key locations*.

c. Protection Recommendations

- Protect the three known populations of mud nama on RMV property and their hydrologic sources.

d. Management Recommendations

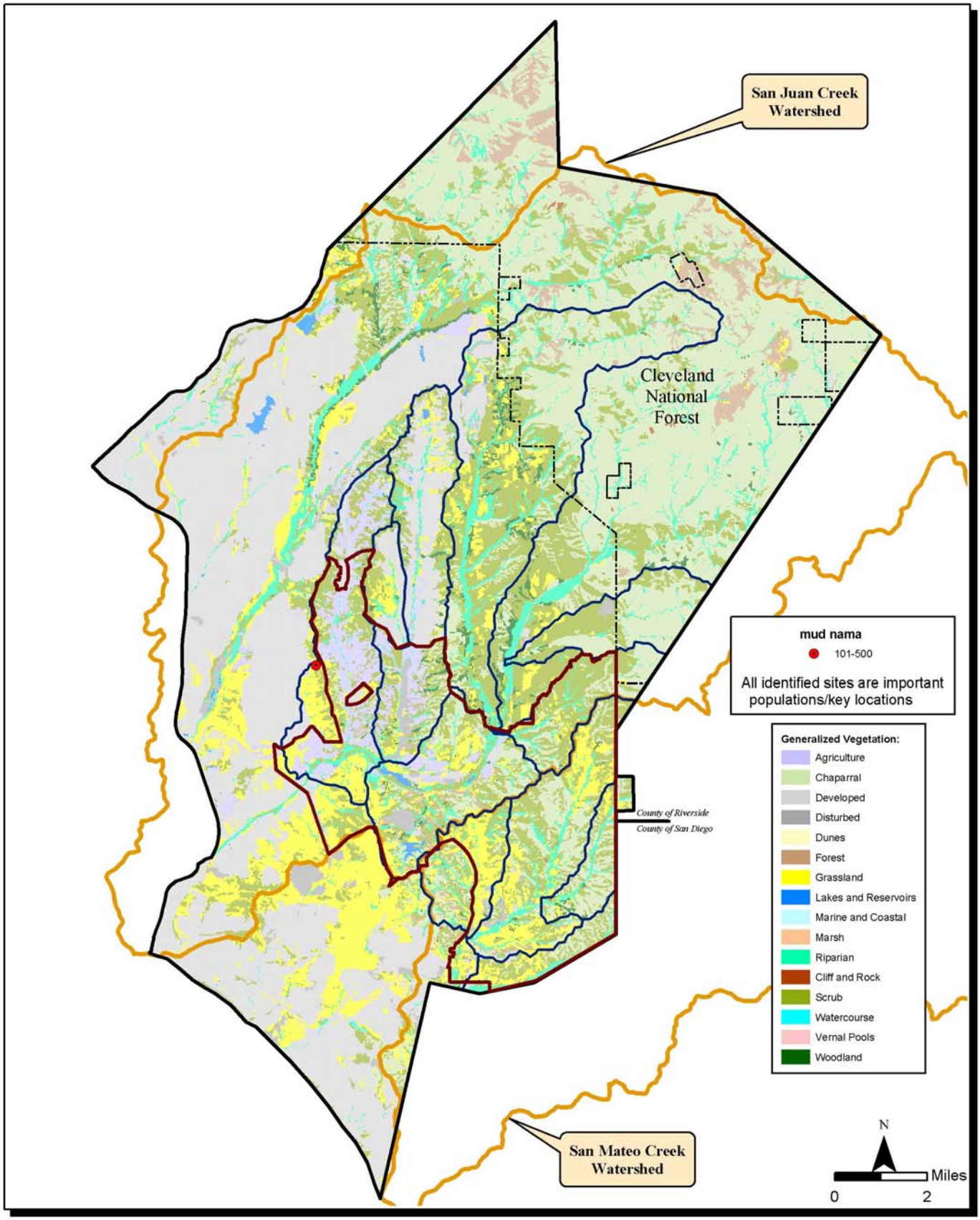
Implement a management program for mud nama, including control of non-native invasive species, management of grazing as part of the adaptive management program, and prevention of human disturbance.

e. Restoration Recommendations

Mud nama responds very favorably to restoration efforts, as exemplified in the Fairview Park vernal restoration project. Five years of monitoring indicate that it has become well established in restored portions of the vernal pool (Bomkamp, pers. comm. 2002).

Through implementation of the adaptive management program significant management opportunities that could substantially increase both the number of occupied sites of mud nama

[3] Bomkamp, Tony. 2002. Personal Observations of the three populations between 1997 and 2001.



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Mud Nama Distribution Map

FIGURE 4-12

along with the total number of individuals within the subregion are available. As noted above, mud nama occupies drying ponds, including vernal pools and like many such annuals is likely dispersed by water fowl which carry seeds over long distances. Such species typically respond well to translocation or introduction efforts.

Potential introduction sites include: 1) the vernal pools located along Radio Tower Road; 2) the two unoccupied vernal pools on Chiquita Ridge; 3) the margins of seasonal ponds in the GERA; and 4) the margins of seasonal ponds in the Tesoro High School Mitigation site in Chiquita Canyon. All of these sites exhibit high potential for success and, as noted above, would result in an increase in the number of occupied site and an increase in total number of individuals.

Sections 4.2.6-22

Species accounts for the remaining planning species listed below are in preparation and will be provided in a future draft of the NCCP/HCP Planning Guidelines.

Birds

cactus wren
tricolored blackbird
yellow-breasted chat
yellow warbler
grasshopper sparrow
golden eagle
white-tailed kite
Cooper's hawk
merlin

Amphibians and Reptiles

western spadefoot toad
southwestern pond turtle
San Diego horned
orange-throated whiptail

Mammals

mountain lion
mule deer

Plants

chaparral beargrass
salt spring checkerbloom

SECTION 5: SUB-BASIN SCALE PLANNING CONSIDERATIONS

The Planning Considerations identified in this section are intended to be used at the sub-basin scale. The Planning Considerations are separated into two sub-groups: 1) those that apply to sub-basins within the San Juan Creek Watershed; and 2) those that apply to sub-basins in the San Mateo Creek Watershed. Each sub-basin description includes:

- A summary of the Planning Considerations – Existing Conditions and Biological Resources for each sub-basin. Planning considerations relating to soils and hydrology should be related to the more extensive review set forth in the Watershed Planning Principles.

- A summary of Planning Recommendations for each sub-basin. The Planning Recommendations are broken down into three general categories: protection, management and restoration. Appropriate goals, performance standards and reporting requirements associated with management and restoration recommendations will be developed in the context of specific management and restoration plans that will be prepared in the future. Not all sub-basins have management and/or restoration recommendations.

- Maps illustrating important biological resources, including listed species and other selected planning species.

- Maps identifying areas recommended for both upland and creek restoration, revegetation, and/or enhancement.

With regard to Sub-Basin Scale Planning Considerations and Planning Recommendations for individual "planning species," it is extremely important to review the "Species Accounts" in Section 4 prior to reviewing the sub-basin planning considerations and recommendations. The Species Accounts in Section 4 provide an overview of each planning species and provide a full set of recommendations for each species on an area wide basis. These recommendations are carried forward into the planning considerations and planning recommendations for each sub-basin set forth in this Section 5. Accordingly, the sub-basin planning considerations and planning recommendations for each species derive from the overall Species Accounts and are presented, along with other sub-basin planning considerations and recommendations, to provide a complete picture of all of the planning species considerations and recommendations for a particular sub-basin. Since not all of the planning species accounts have been completed, additional species-specific planning considerations and recommendations will be added to the Sub-Basin Scale Planning Considerations as these accounts are completed.

Species recommendations are presented for planning purposes to assist in selecting and evaluating Habitat Reserve design alternatives and the preliminary and draft Conservation Strategy. Specific mitigation requirements for individual species, including performance

standards, will be prepared in conjunction with subsequent determinations regarding those species that will be proposed for regulatory coverage upon final approval of the Southern Subregion NCCP/HCP.

Finally, it should be noted that management and restoration recommendations will continue to be amplified as further information is obtained (e.g., a recent report on invasive plants species and other draft reports are under review) and as draft management plans are completed (e.g., a Grazing Management Plan will identify both transitional and long-term grazing areas and practices and a Fire Management Plan will address fuel modification standards, fire suppression practices and strategies and prescribed burns for habitat restoration and long-term management).

5.1 San Juan Creek Watershed

Figures 5-1 through 5-5 provide planning species maps for coastal sage scrub, riparian/aquatic habitat, historic raptor nest sites, grassland, and plants, respectively, for the San Juan Creek Watershed.

5.1.1 Chiquita Canyon Sub-basin

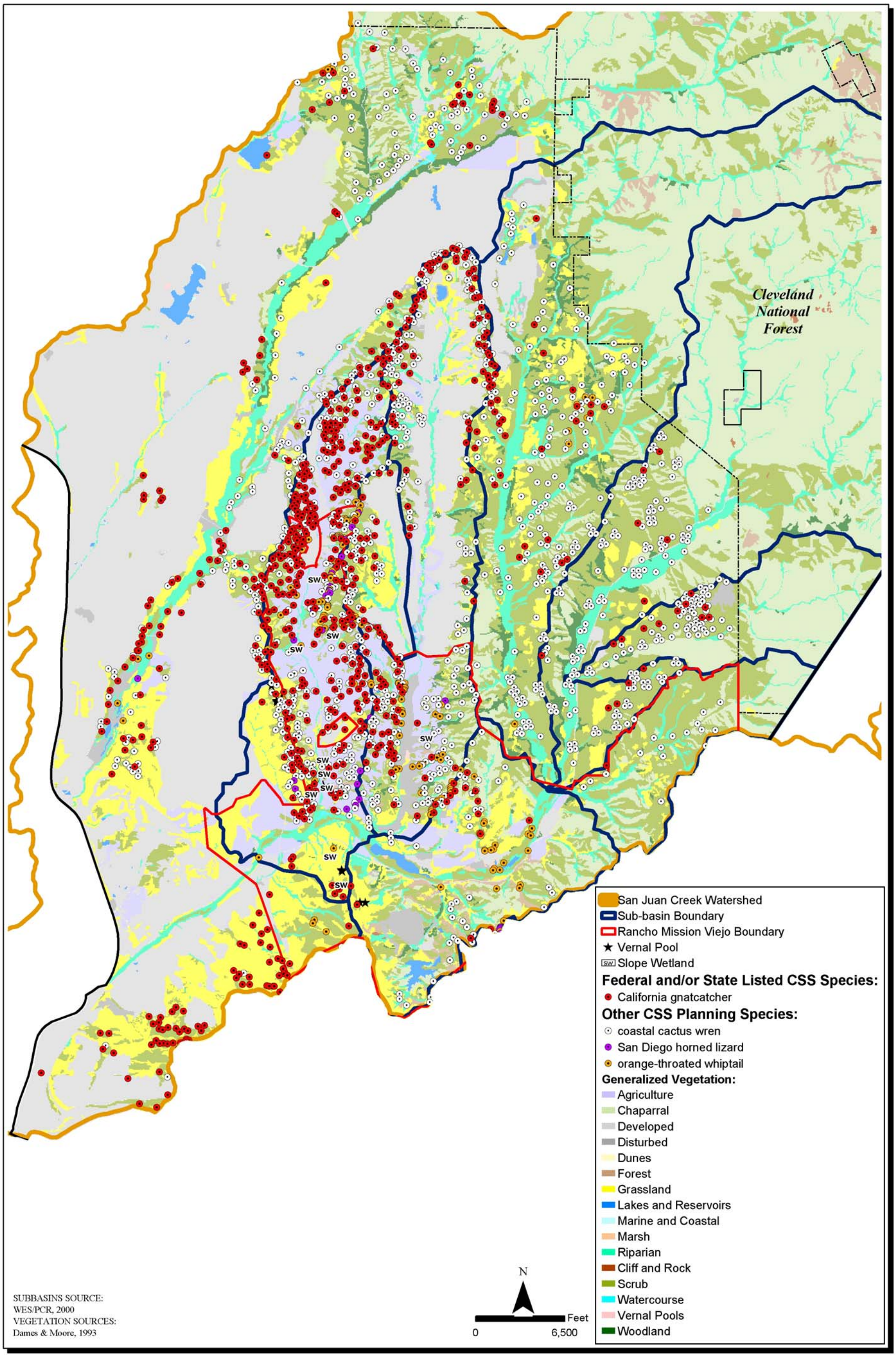
The Chiquita Canyon sub-basin is divided into three geographic areas: upper Chiquita Canyon, defined as the portion of the sub-basin north of Oso Parkway, middle Chiquita, defined as the portion of the sub-basin south of Oso Parkway to the "Narrows" and lower Chiquita Canyon defined as the portion of the sub-basin from the "Narrows" to the sub-basin boundary south of San Juan Creek and Ortega Highway. Upper Chiquita Canyon is protected by a conservation easement. Middle and lower Chiquita Canyon would be subject to the sub-basin planning considerations and recommendations described below. To distinguish the two ridges bordering Chiquita Canyon, this document refers to the east ridge as Chiquadora Ridge and the west ridge as Chiquita Ridge. The eastern portion of Chiquadora Ridge is in the Gobernadora sub-basin.

a. Planning Considerations - Existing Conditions and Biological Resources

- Soils in the main canyon and eastern side canyons primarily are sandy. Soils on the western side are primarily silty sand. Ridges on the east side of the valley are characterized by rock outcroppings and areas of clay hardpans that are eroded remnants of claypans.

- Elevations in the sub-basin range from approximately 200 feet above mean sea level at the confluence with San Juan Creek to 1,200 feet in the north end of the sub-basin.

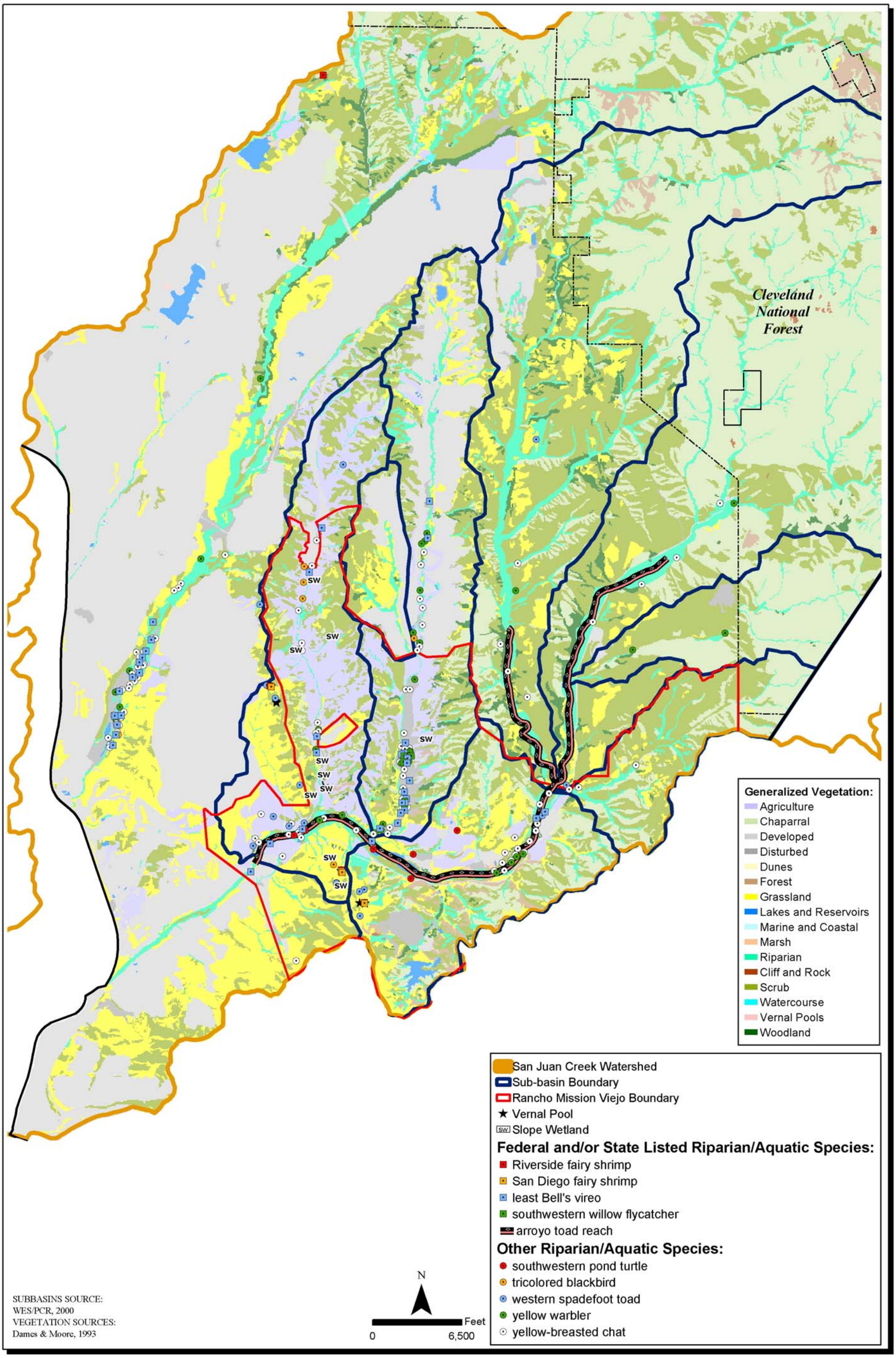
- The sub-basin is approximately 5.7 miles from the Pacific Coast.



Draft NCCP/HCP Planning Guidelines

San Juan Creek Watershed - Coastal Sage Scrub Wildlife Species

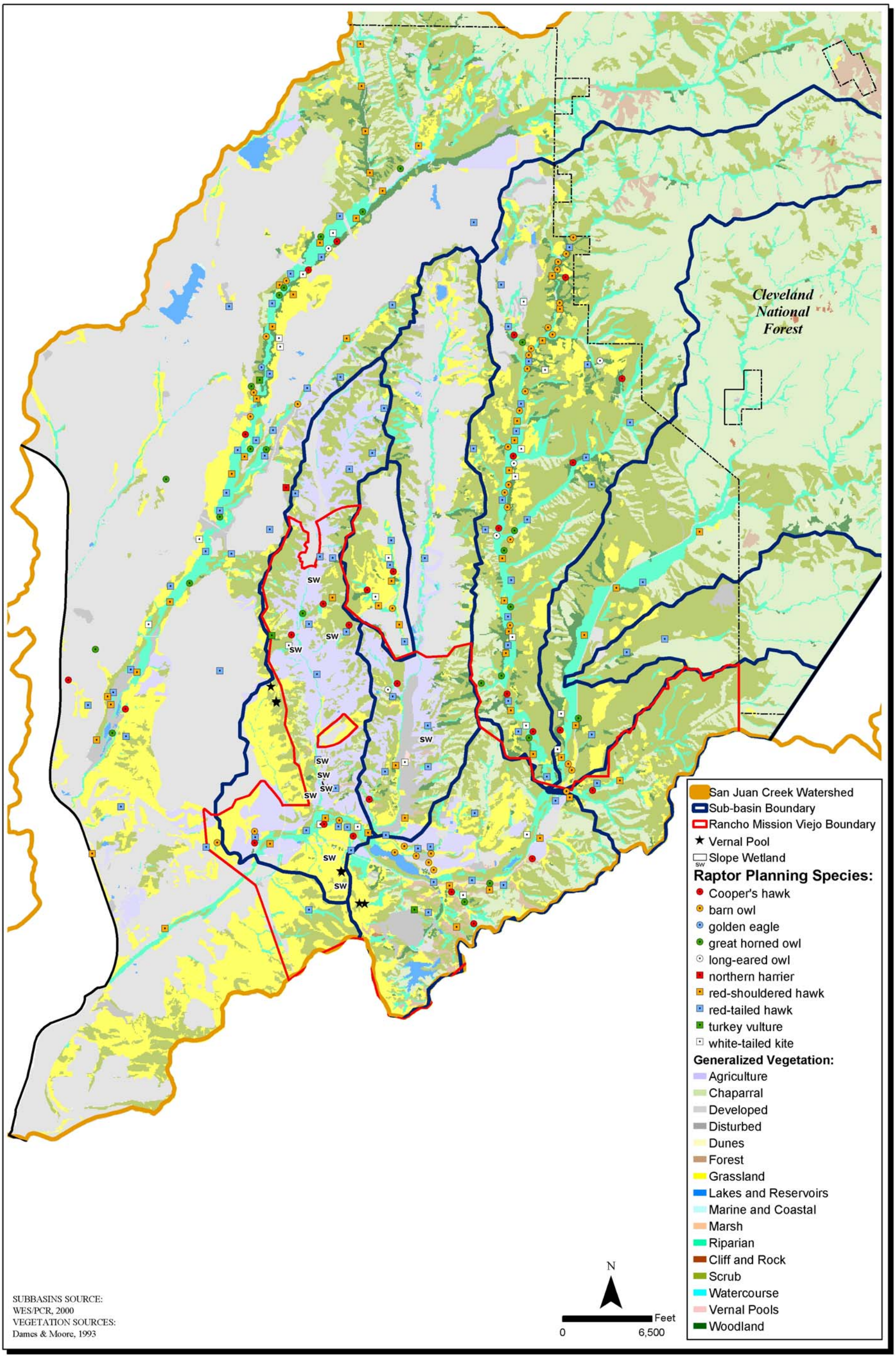
FIGURE 5-1



Draft NCCP/HCP Planning Guidelines

San Juan Creek Watershed - Riparian/Aquatic Wildlife Species

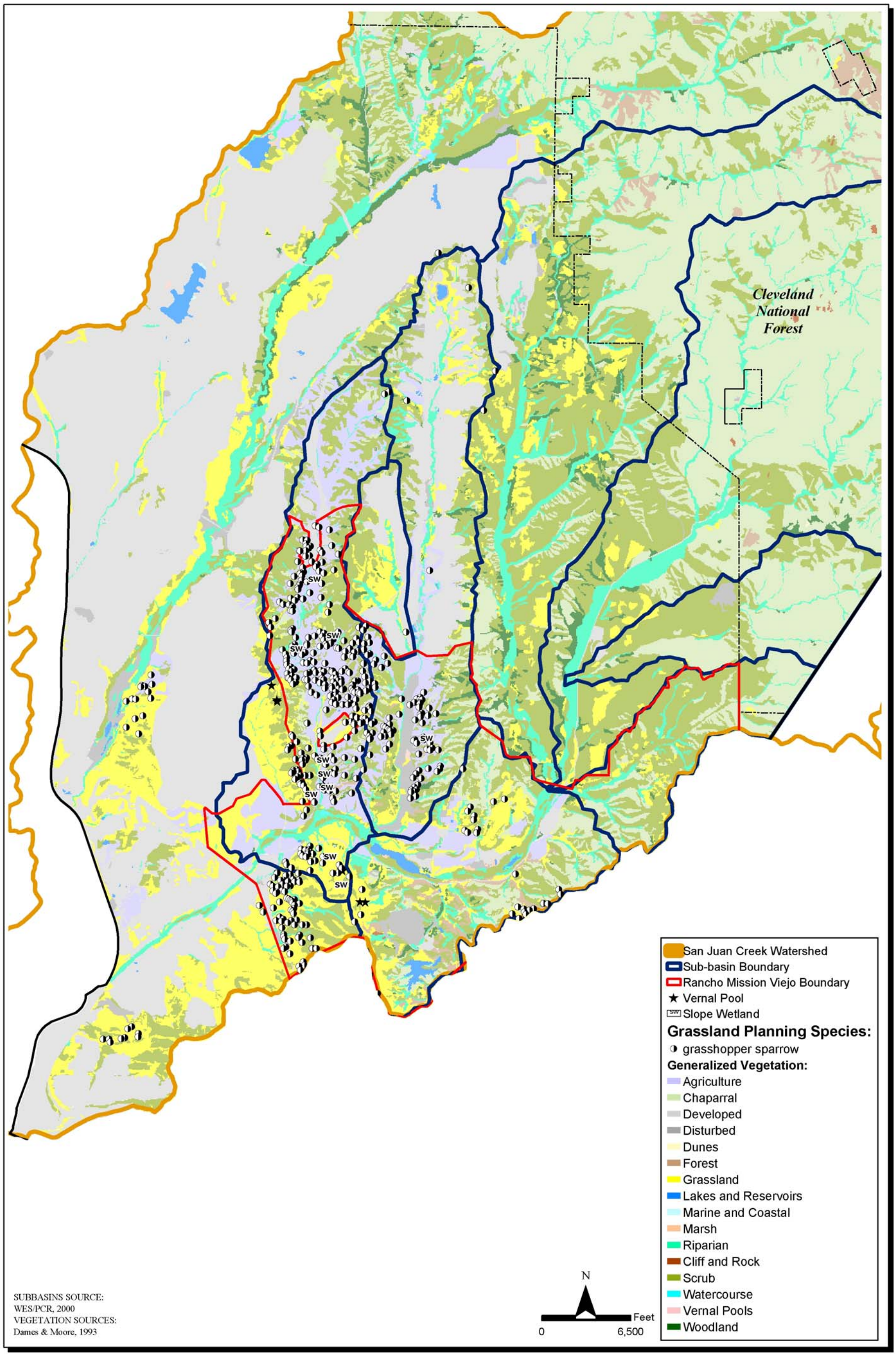
FIGURE 5-2



Draft NCCP/HCP Planning Guidelines

San Juan Creek Watershed - Historic Raptor Nest Sites

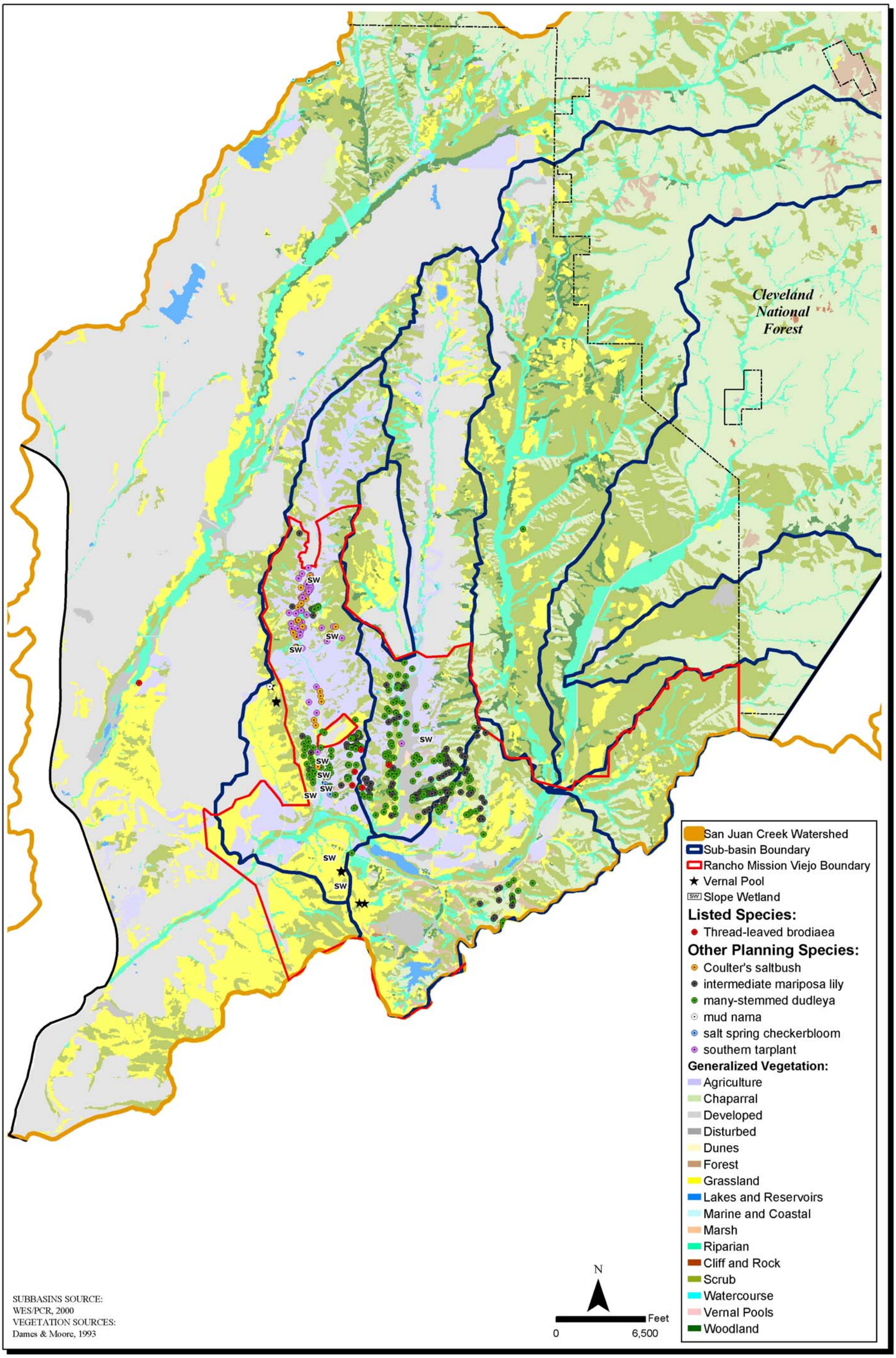
FIGURE 5-3



Draft NCCP/HCP Planning Guidelines

San Juan Creek Watershed - Grassland Wildlife Species

FIGURE 5-4



Draft NCCP/HCP Planning Guidelines

San Juan Creek Watershed - Plant Planning Species

FIGURE 5-5

- Upland habitats mostly are comprised of coastal sage scrub, agriculture, patches of native and annual grassland and patches of chaparral.

- The Chiquita Canyon area north of San Juan Creek, including Chiquadora Ridge and Wagon Wheel Canyon adjacent to the Chiquita sub-basin, supports a *major population* of the California gnatcatcher, both within the Southern Subregion, and within the range of the gnatcatcher in southern California. This area, which extends from the "horseshoe" in northern Coto de Caza south to San Juan Creek, includes 404 mapped locations of the gnatcatcher and accounts for 55 percent of the mapped gnatcatcher locations in the subregion. This is the *major population* in the subregion. A substantial portion of this population is a *key location*.

- The portion of the sub-basin south of San Juan Creek supports 5-6 California gnatcatcher locations in habitat linkage K. This small concentration of gnatcatcher locations, which overlaps with the Trampas Canyon subunit, as described below, is an *important population* in a *key location* because it provides north-south connection for the species.

- The mainstem creek supports herbaceous riparian, southern willow scrub, arroyo willow riparian forest, and coast live oak riparian forest habitats that support the least Bell's vireo and several other sensitive riparian and aquatic species, including yellow-breasted chat, yellow warbler, southwestern pond turtle (near the confluence with San Juan Creek), western spadefoot toad, and two-striped garter snake.

- The portion of San Juan Creek within the Chiquita sub-basin supports the western most extent of the San Juan Creek *major population* of arroyo toad (Bloom [1998] mapped potential habitat to an area about 3,000 feet downstream of Antonio Parkway bridge, but toads have not been observed farther west than about the confluence with Chiquita Creek.) This extension of the San Juan Creek *major population* is not considered a *key location* for at least three reasons: 1) the viability of the upstream *key locations* in Upper San Juan Creek and Bell Canyon are not reliant on this small downstream population; 2) recent breeding has been limited to an area just downstream of Trampas Canyon supported by an artificial runoff source; and 3) the proliferation of arundo in this reach of San Juan Creek is contributing to ongoing degradation of toad habitat.

- In addition to the perennial Chiquita Creek, several slope wetlands are present in lower Chiquita Canyon and the portion of the sub-basin south of San Juan Creek. These wetland features have varying conditions and support saltspring checkerbloom in the two southern most slope wetland locations.

- The riparian and woodland habitats in the mainstem creek and side canyons provide nest sites for several raptor species, including Cooper's hawk, white-tailed kite, red-shouldered hawk, great horned owl and barn owl.

- The sub-basin provides breeding and/or foraging habitat for a variety of the other sensitive wildlife species, including coastal cactus wren, ferruginous hawk, prairie falcon, merlin, northern harrier, wintering burrowing owls, loggerhead shrike, grasshopper sparrow, rufous-crowned sparrow, California horned lark, tricolored blackbird (nomadic colonies), orange-throated whiptail, coastal western whiptail, San Diego horned lizard, northern red-diamond rattlesnake, mule deer and mountain lion.

- A tricolored blackbird breeding colony has been observed on slopes south of San Juan Creek behind an RMV residence in the recent past (300+ pairs in 2001; P. Bloom, pers. comm. 2002).

- Vernal pools along Radio Tower Road south of Ortega Highway appear to be associated with localized bedrock landslides from the San Onofre and Monterey formations and support both the federally-listed Riverside fairy shrimp (vernal pool 2) and San Diego fairy shrimp (vernal pools 1 and 2), and the western spadefoot toad.

- Vernal pools (4 and 6) on Chiquita Ridge support San Diego fairy shrimp. The largest pool (4) also supports Riverside fairy shrimp and mud nama. A third vernal pool (5) was created as mitigation for Antonio Parkway and currently does not support either species of fairy shrimp.

- The state/federally-listed thread-leaved brodiaea is found in five locations on Chiquadora Ridge southeast of the wastewater treatment plant, including the eastern portion of the Chiquita sub-basin and the western portion of the Gobernadora sub-basin. The easternmost population on Chiquadora Ridge has about 2,000 flowering stalks. Together these five locations comprise a *major population*, substantial portions of which are a *key location*.

- The sub-basin, including Chiquadora Ridge, supports four general areas of many-stemmed dudleya (CNPS List 1B):

    - The Chiquadora Ridge locations number about 9,600 individuals and comprise a *major population* in a *key location*.

    - Approximately thirty-five locations on Chiquita Ridge comprise a total of about 2,430 individuals and are an *important population* in a *key location*. This *important population* includes seven locations totaling 100 to 420 individuals each.

    - Locations in lower Chiquita Canyon east of the creek and south of treatment plant comprise about 1,600 individuals. This is an *important population* that would be considered to be a *key location* if the populations on Chiquadora Ridge are not protected.

- The ridgeline east of the "Narrows" in middle Chiquita supports four locations of dudleya, with one numbering about 370 individuals and the other three numbering from 46 to 75 individuals. Because these locations are small and isolated from other locations, these individuals are not considered an *important population*.

- The sub-basin, including Chiquadora Ridge, supports four general areas of intermediate mariposa lily (CNPS List 1B):

  - Lower Chiquita Ridge west of the creek supports three locations of intermediate mariposa lily numbering about 21, 47, and 625 individuals. Although these locations do not support large populations, together they may be considered to be an *important population* in a *key location* because Chiquita Ridge is a key landscape feature and habitat linkage in the subregion.

  - Lower Chiquita Canyon east of the creek and south of the treatment plant supports about 18 locations, with most uncounted, but one relatively large population of 660 individuals. These scattered locations, along with the location numbering 660 individuals, may be considered an *important population.* Whether this population is also in a *key location* depends of the long-term status of the Chiquita Ridge and Chiquadora Ridge populations.

  - Middle Chiquita Canyon supports five scattered locations north of the "Narrows" and both east and west of the creek. The largest of the five locations is west of the creek and has about 260 individuals. Another location west of the creek only supports two individuals and the three locations east of the creek support four, 12, and 70 individuals. Two locations also occur north of Oso Parkway in the Upper Chiquita Conservation Easement, with one location supporting only one individual and the other supporting ten individuals. Because of the few number of locations and the small number of individuals at each site, these locations probably are not *important populations* or in *key locations*.

  - Chiquadora Ridge supports about 12 locations totaling about 1,580 individuals. These locations overlap the Chiquita and Gobernadora sub-basins and constitute a *major population* in a *key location.* The Chiquadora Ridge population is important for maintaining the landscape connection between the intermediate mariposa lily population on Chiquita Ridge and the populations in the San Mateo Watershed.

- The sub-basin supports four general locations for southern tarplant (CNPS List 1B):

  - Middle Chiquita supports about 39 mapped locations ranging up to about 30,000 individuals in the largest. Estimated discrete locations numbering 7,000, 7,500, 10,000, 20,000, and 30,000 individuals, respectively, are located west of the creek. Locations east of the creek are more disparate and smaller, with the largest

numbering about 750 individuals. These 39 locations comprise a *major population* and the portion of the population west of the creek is a *key location*.

- The Tesoro High School Mitigation site in Lower Chiquita supported approximately 1,100 individual in 2000, 6,000 individuals in 2001 and 11,000 individuals in 2002 as determined during monitoring of the population. This population was introduced to the site in Fall of 1999 as mitigation for impacts to the tarplant at the High School site. This population appears to be self-sustaining and has increased for three consecutive years and should now be considered a *major population* in a *key location*

- Further south in Lower Chiquita Canyon there is one population numbering about 400 individuals. This population is relatively small for this species, but should be considered functionally part of the Tesoro *major population*.

- A wetland seep between the Gobernadora and Chiquita sub-basins supports a few hundred individuals during optimal years. While not large enough to be considered a major population, this population may potentially be an *important population* in a *key location.*

- The sub-basin supports five general locations of Coulter's saltbush (CNPS List 1B):

  - Lower Chiquita Canyon west of the creek supports two locations numbering 200 and 400 individuals, respectively. These two locations are an *important population* and comprise a *key location* because of the rarity of the species in the region.

  - Middle Chiquita just above and below the "Narrows" supports numerous locations ranging from the 10s to 600 individuals. The location with 600 individuals is east and adjacent to the creek about midway between the "Narrows" and Tesoro High School. Locations with 150, 150 and 200 individuals are west of the creek. These locations overlap substantially with the largest southern tarplant population. This group of locations east and west of the creek is a *major population* in a *key location*.

  - Middle Chiquita just to the northwest of the treatment plant supports five locations, of which four are west of the creek. The locations west of the creek number 25, 50, 150 and 360 individuals and the location east of the creek has 100 individuals. These five locations constitute an *important population.* The locations west of the creek constitute a *key location*.

  - Two small locations are located in a major side canyon southeast of the Narrows. These locations number six and 10 individuals, respectively.

- One small population of less than 20 individuals occurs with southern tarplant (noted above) at a wetland seep between the Gobernadora and Chiquita sub-basins.

- Saltspring checkerbloom (CNPS List 1B) occurs in the two slope wetlands in lower Chiquita Canyon. These are *important populations* in *key locations* because they are the only two locations known from the subregion.

- The sub-basin also supports populations of Palmer's grapplinghook (CNPS List 4) and Catalina mariposa lily (CNPS List 4). The grapplinghook occurs in approximately 35 scattered locations (no population estimates) on Chiquadora Ridge southeast of the wastewater treatment plant and at a location supporting about 300 individuals east of the "Narrows." The Catalina mariposa lily is more widely distributed in the sub-basin, with clusters of individuals on Chiquadora Ridge southeast of the wastewater treatment plant, on Chiquita Ridge west of the "Narrows" and on a ridgeline east of the "Narrows."

- The sub-basin provides both north-south and east-west movement opportunities for mountain lion, mule deer, bobcat, coyote and gray fox. Coastal sage scrub habitat along Chiquita Ridge provides north-south movement opportunities for California gnatcatchers, cactus wrens, and other sensitive sage scrub species. A known important east-west movement route includes a wildlife corridor from Arroyo Trabuco situated between the Ladera Ranch and Las Flores developments. Based on existing landscape features, potential habitat linkages from Chiquita Ridge to Sulphur Canyon are located just north of the wastewater treatment plant and through the "Narrows" area south of Tesoro High School.

b. Planning Recommendations

1. Protection Recommendations

- Protect the major north-south connection to Central San Juan Creek by providing a habitat linkage between Chiquita Creek and the eastern edge of the Ladera Open Space and by restricting new impervious surfaces west of Chiquita Creek in order to maintain habitat integrity between the creek and Chiquita Ridge.

- Maintain east-west biological connectivity by protecting habitat linkages and wildlife corridors between Arroyo Trabuco, Chiquita Canyon, and Gobernadora Canyon. Biological connectivity should be maintained between Chiquita, Gobernadora and Arroyo Trabuco by protecting habitat linkages at minimum of three locations within the sub-basin: 1) via rim-to-rim preservation of Sulphur Canyon (approximately 2,000 to 2,500 feet wide); 2) at the "Narrows" where the canyon is only 700-800 feet wide (approximately 3,000 feet south of Tesoro High School) and connects to Sulphur Canyon; and 3) in contiguous patches of

coastal sage scrub through the major canyon north and east of the wastewater treatment plant.

- Protect breeding and foraging habitat for the least Bell's vireo within Chiquita Canyon by focusing on protection of riparian habitat in Chiquita Creek.

- Protect breeding habitat and, to the extent feasible, protect foraging habitat for raptors and other species along Chiquita Creek.

- Protect riparian habitat in Chiquita Canyon by recognizing the influences of terrains and hydrology on the Chiquita Creek riparian system (see Watershed and Sub-basin Planning Principles).

- Protect the two vernal pools and their contributing hydrologic sources along Radio Tower Road that support the Riverside fairy shrimp, San Diego fairy shrimp and western spadefoot toad. The vernal pools located on Chiquita Ridge are within the existing protected Ladera Open Space.

- Protect slope wetlands and maintain their primary sub-surface water supply recharge characteristics and, where avoidance is infeasible, minimize and mitigate impacts.

- In conjunction with the large population of 2,000 thread-leaved brodiaea flowering stalks on Chiquadora Ridge in the Gobernadora sub-basin, protect two of the four small locations of thread-leaved brodiaea in Chiquita Canyon. Combined with the large population on Chiquadora Ridge, protection of these *key locations* would contribute to protection of a *major population.*

- Protect the Chiquita Ridge *important population* and *key location* of many-stemmed dudleya totaling about 2,430 individuals in approximately 35 discrete locations. This population includes seven locations totaling 100 to 420 individuals each.

- Protect approximately six locations of intermediate mariposa lily along Chiquita Ridge together with the location south of the treatment plant that supports 660 individuals, totaling protection of about 1,600 individuals. Although these locations are scattered, together they comprise an *important population* in a *key location*

- Protect the 14 locations of intermediate mariposa lily comprising the major population on Chiquadora Ridge that overlaps the Chiquita and Gobernadora sub-basins, for a total protection of 2,000 individuals.

- Minimize impacts to the *key location* of southern tarplant west of Chiquita Creek in Middle Chiquita Canyon to the maximum extent feasible. Minimize impacts to the remainder of the *major population* in Middle Chiquita Canyon. Mitigate impacts to

southern tarplant in a manner similar to the successful Tesoro mitigation project (ongoing mitigation projects in Chiquita Canyon have demonstrated over three successive years that this plant can be readily propagated from seed).

- Protect *major population* of southern tarplant in a *key location* in Lower Chiquita Canyon.

- Protect the *key locations* of Coulter's saltbush in Middle and Lower Chiquita Canyon. Minimize impacts to *important populations* within the sub-basin and mitigate unavoidable impacts in Chiquita Canyon**.**

- Protect the two *key locations* of saltspring checkerbloom in the slope wetlands in lower Chiquita Canyon.

- Protect the *important population* of the California gnatcatcher and coastal sage scrub in the portion of the sub-basin south of San Juan Creek to maintain resident and dispersal habitat for the gnatcatcher between Chiquita Ridge and San Juan Capistrano and San Clemente.

- Based on the application of the above connectivity protection recommendations and the Species Accounts recommendations, the goal is to protect at least 80 percent of the existing coastal sage scrub and gnatcatcher locations within the *major population* (including those sites within the Chiquita sub-basin and the Chiquadora Ridge portion of the Gobernadora sub-basin). Additional conservation of gnatcatcher habitat will be achieved by implementation of the restoration recommendations described below and in Section 4.

2. Management Recommendations

- Implement a cowbird trapping program to mitigate for impacts to existing habitat within the sub-basin and for potential impacts associated with future development. The cowbird trapping program will be evaluated on an annual basis and trap locations and trapping effort will be adjusted as part of the overall adaptive management program (e.g., if the number of trapped cowbirds drops to a prescribed threshold, the trapping program may be terminated or otherwise modified).

- Implement a management program for protected sensitive plant locations in the sub-basin, including control of non-native invasive species, management of grazing and minimization of human access and disturbance as part of the adaptive management program,. The adaptive management recommendations for plants are described more fully in Section 4.

3. Restoration Recommendations

- Implement a coastal sage scrub (CSS)/valley needlegrass grassland (VGL) restoration program to enhance habitat connectivity and mitigate for impacts to existing habitat

associated with future development (Figure 5-6). The CSS/VGL restoration program is discussed more fully in Section 6.

- Translocate salvaged thread-leaved brodiaea and many-stemmed dudleya to CSS/VGL restoration and enhancement areas where feasible and appropriate. Potential restoration and enhancement areas in the sub-basin include Chiquita Ridge and Chiquadora Ridge. Receiver areas should support clay soils suitable for brodiaea and many-stemmed dudleya, and should be placed in locations that maximize connectivity and genetic exchange.

- Salvage clay topsoils from development areas where feasible and appropriate and transport to restoration areas. Salvaged topsoils may be used to create additional suitable brodiaea and dudleya habitat and may contain seedbank.

- Initiate an intermediate mariposa lily seed collection program in 2003 if sufficient rain falls to warrant the collection program. Receiver sites should be identified in the winter of 2003 and a pilot planting program should be implemented to determine the effectiveness of propagation from seed.

- Translocate salvaged intermediate mariposa lily bulbs to areas where suitable soil conditions occur. Specific translocation areas have not been identified, but based on the existing distribution potential general translocation areas in the sub-basin area include Chiquita Ridge and Chiquadora Ridge.

- Translocate salvaged southern tarplant and Coulter's saltbush to suitable restoration and enhancement areas in the sub-basin. Receiver areas should support alkali soils suitable for both species and should be placed in locations that maximize connectivity and genetic exchange.

- Implement restoration efforts to address localized headcuts within the sub-basin as further described in the Watershed and Sub-basin Planning Principles – Chiquita Sub-basin (Figure 5-6).

5.1.2 Gobernadora Canyon Sub-basin

The Gobernadora Canyon sub-basin is divided into two main geographic areas: upper Gobernadora Canyon, which includes the Coto de Caza residential development; and lower Gobernadora Canyon, which is under RMV ownership. The discussion herein is limited to lower Gobernadora Canyon within RMV ownership.

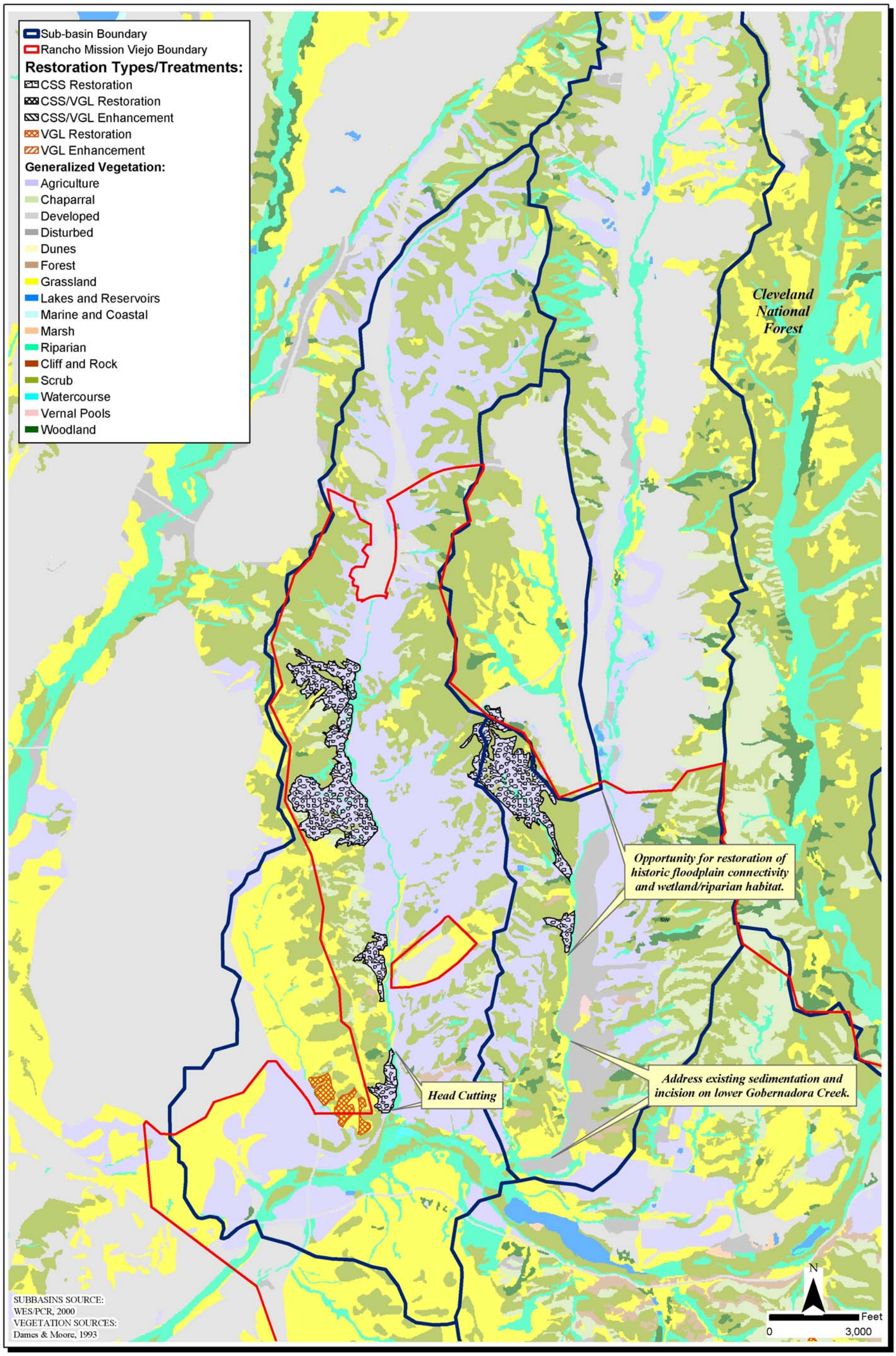


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FIGURE 5-6

CSS/VGL and Creek Restoration for Canada Chiquita/Narrow Canyon & Canada Gobernadora Sub-basins

a. Planning Considerations - Existing Conditions and Biological Resources

- Soils in the valley floor of the sub-basin are characterized by deep alluvial sandy deposits with interbedded clay lenses. The hill slopes and ridges exhibit areas of exhumed hardpan overlying sandy and silty substrates (the remnants of claypans formed in the geologic past) and also include exposed rock outcrops or other areas of steep slopes.

- Elevations in the sub-basin range from approximately 260 feet above sea level at the confluence with San Juan Creek to 780 feet at the head of Sulphur Canyon west of the main valley.

- The sub-basin is approximately 6.5 miles from the Pacific Coast.

- Uplands are comprised of coastal sage scrub, chaparral, grassland, agriculture, and patches of oak woodlands. The more rugged uplands on the western side of the creek are dominated by coastal sage scrub, grassland and agriculture. The flat to rolling terrain on the east side of the creek supports a mixture of agriculture, coastal sage scrub, chaparral and oak woodlands. Sulphur Canyon, located west of the mainstem creek and below Chiquadora Ridge, is bordered by agriculture (grazing pasture and barley fields) and coastal sage scrub.

- Chiquadora Ridge west of the creek includes a part of the *major population* of the California gnatcatcher in the Chiquita Canyon area described above. The slopes east of the creek support a smaller population of the California gnatcatcher, probably due to the higher percentage of chaparral.

- Southern willow scrub in the revegetated wetland mitigation area (GERA) provides nesting habitat for least Bell's vireo, southwestern willow flycatcher, yellow-breasted chat, Cooper's hawk, red-shouldered hawk, and barn owl.

- A large colony of tricolored blackbirds periodically occurs in lower Gobernadora Canyon at the boundary on RMV property just south of the boundary with Coto de Caza. The birds nest in wetland areas within Coto de Caza just north of the RMV boundary and likely forage in the grassland and agricultural areas on RMV land.

- Other wildlife species in lower Gobernadora Canyon include white-tailed kite, long-eared owl, rufous-crowned sparrow, coast patch-nosed snake, northern red-diamond rattlesnake, western whiptail, San Diego horned lizard, Coronado skink and mule deer.

- Raptors using the grasslands and agriculture areas in the sub-basin for foraging include ferruginous hawk and merlin.

- Chiquadora Ridge within the Gobernadora sub-basin supports *major populations* of thread-leaved brodiaea (the location with 2,000 flowering stalks), many-stemmed dudleya (9,600 individuals), and intermediate mariposa lily (1,580 individuals in about 12 locations) described above for the Chiquita sub-basin.

- Many-stemmed dudleya occurs in the Gobernadora sub-basin east of the creek in about 35 scattered locations ranging from the tens to 310 individuals. The Central San Juan Creek sub-basin north of the creek supports about 20 locations that are part of the Gobernadora population. These locations range up to about 2,000 individuals, but the median population size is much smaller at 50 individuals; 13 locations number 11-95 individuals and five number 100-345 individuals. Combined, these locations total more than 5,600 individuals and comprise a *major population.*

- Intermediate mariposa lily occurs in the Gobernadora sub-basin east of the creek and the northern portion of the Central San Juan Creek sub-basin in more than 50 locations, with eight locations numbering more than 200 individuals and the two largest locations 775 and 1,300 individuals each. This area supports a total of about 6,600 individuals. The location supporting 1,300 individuals is the single largest population in the subregion. These locations comprise a *major population* in a *key location*.

- Portions of the Ladera Ranch Mitigation site in GERA, on the west side of the Gobernadora Creek "spur" that enters the mitigation area, supports an estimated 10,000+ individuals of southern tarplant that have colonized the mitigation area. This population is a *major population* in a *key location*.

- Other sensitive plants known from the sub-basin include Catalina mariposa lily and Palmer's grapplinghook in the uplands and paniculate tarplant (CNPS List 4) in the valley bottom. A cluster of about 27 Catalina mariposa lily locations are on Chiquadora ridge associated with the cluster in the Chiquita sub-basin southeast of the wastewater treatment plant. Only three locations of Catalina mariposa lily are located east of Gobernadora Creek. There are about 23 locations of Palmer's grapplinghook in the sub-basin, with almost all east of the creek in association with the large population of many-stemmed dudleya. The paniculate tarplant is known from the along the creek near the boundary with Coto de Caza.

- The sensitive arroyo chub is known from the mouth of Gobernadora Creek at the confluence with San Juan Creek.

- Lower Gobernadora Canyon, including Sulphur Canyon, provides an important east-west connection between Chiquita and Wagon Wheel canyons to Bell Canyon and Caspers Wilderness Park. The riparian spine along the mainstem Gobernadora Creek, combined with the adjacent uplands along Chiquadora Ridge, provide a north-south habitat connection for mountain lions and other large mammals. The uplands along Chiquadora Ridge also

provide habitat and a north-south connection for California gnatcatcher, cactus wren and a variety of other birds, reptiles and small mammals.

- Historic photographs indicate that Gobernadora Creek meandered freely across the valley floor over most of the length of the valley downstream from the mouth of Wagon Wheel Canyon.

- Potentially excessive surface and groundwater originates in the upstream portion of the sub-basin. These sources of water have contributed to erosion and incision of the mainstem and downstream deposition of sediments.

b. Planning Recommendations

1. Protection Recommendations

- Maintain a continuous upland habitat linkage along the east-facing slopes of Chiquadora Ridge between San Juan Creek and Sulphur Canyon.

- Protect Sulphur Canyon rim-to-rim to maintain a functional biological connection from Gobernadora to Gen. Thomas F. Riley Regional Park in Wagon Wheel Canyon and upper Chiquita Canyon.

- Protect a 2,000- to 2,500-foot area along the southern boundary of Coto de Caza to provide for functional east-west wildlife movement from Sulphur Canyon to Bell Canyon.

- Minimize impacts to native grasslands. Any impacts resulting from future land uses will be addressed through an overall native grasslands restoration program, described in Section 6.

- Protect the southern willow scrub in GERA that provides nesting habitat for least Bell's vireo, southwestern willow flycatcher, yellow-breasted chat, Cooper's hawk, red-shouldered hawk, and barn owl.

- Avoid and minimize impacts to oak woodlands in northern Gobernadora along the ridgelines between the Gobernadora and Bell Canyon sub-basins.

- Keep open sufficient valley bottom south of Coto de Caza and above the knickpoint to allow creek meander for floodplain connection**.** Refer also to the Watershed and Sub-basin Planning Principles – Chiquita Gobernadora Sub-basin.

- Protect sufficient grassland habitat in the valley bottom in the northern portion of lower Gobernadora on RMV property to support a nesting population of the tricolored blackbird. (The existing nesting ponds are located within Coto de Caza.)

- Protect the thread-leaved brodiaea *major population* in a *key location* supporting approximately 2,000 flowering stalks on Chiquadora Ridge.

- Protect the 12 locations of intermediate mariposa lily comprising the *major population* on Chiquadora Ridge that overlaps the Chiquita and Gobernadora sub-basins, for total protection of about 1,580 individuals.

- Protect the Chiquadora Ridge *major population* of many-stemmed dudleya totaling about 9,580 individuals in approximately 52 discrete locations. This population includes 24 locations totaling 100 to 750 individuals each, with nine of these locations numbering more than 500 individuals.

- Protect the *major population* of southern tarplant totaling 10,000+ individuals located in GERA.

- Consistent with the Species Accounts recommendations and the Planning Recommendations for the Chiquita Sub-Basin, protect at least 80 percent of the coastal sage scrub and gnatcatcher sites along the eastern slopes of Chiquadora Ridge to contribute to achieving the overall goal of protecting at least 80 percent of the major population of gnatcatchers extending from Chiquita Canyon across to Gobernadora Creek. A further goal is the maintenance of connectivity between the protected coastal sage scrub patches to allow for dispersal of gnatcatchers between patches.

2. Management Recommendations

- Implement a cowbird trapping program to mitigate for potential impacts to native bird species associated with any proposed residential development in the sub-basin. The cowbird trapping program will be evaluated on an annual basis and trap locations and trapping effort will be adjusted as part of the overall adaptive management program (e.g., if the number of trapped cowbirds drops to a prescribed threshold, the trapping program may be terminated or otherwise modified).

- Protect existing riparian habitat downstream of the knickpoint in GERA for the least Bell's vireo, southwestern willow flycatcher and other riparian nesting bird species.

- Protect downstream habitat for the arroyo toad, least Bell's vireo, arroyo chub, and other sensitive riparian and aquatic species by maintaining hydrology, water quality and sediment delivery in San Juan Creek and minimizing additional loadings of nutrients or toxics.

- Implement a management program for protected sensitive plant locations in the sub-basin, including control of non-native invasive species, management of grazing as part of the adaptive management program, and prevention of human disturbance. The management recommendations for plants are described more fully in Section 4.

3. Restoration Recommendations

- Implement a coastal sage scrub restoration program in Sulphur Canyon to enhance habitat connectivity and mitigate for impacts to existing habitat associated with future development (Figure 5-6).

- Translocate salvaged many-stemmed dudleya to CSS/VGL restoration and enhancement areas where feasible and appropriate. Potential restoration and enhancement areas in the sub-basin include Chiquadora Ridge. Receiver areas should support clay soils suitable for dudleya and should be placed in locations that maximize connectivity and genetic exchange.

- Salvage clay topsoils from development areas where feasible and appropriate and transport to restoration areas. Salvaged topsoils may be used to create additional suitable dudleya habitat and may contain seedbank.

- Translocate salvaged intermediate mariposa lily bulbs to areas where suitable soil conditions occur. Specific translocation areas have not been identified, but based on the existing distribution, potential general translocation areas in the sub-basin area include Chiquadora Ridge.

- Initiate an intermediate mariposa lily seed collection program in 2003 if sufficient rain falls to warrant the collection program. Receiver sites should be identified in the winter of 2003 and a pilot planting program should be implemented to determine the effectiveness of propagation from seed.

- Implement a restoration program in Gobernadora Creek which addresses 1) the historic creek meander above the knickpoint; 2) upstream land use induced channel incision and erosion, including potentially excessive surface and groundwater originating upstream (Figure 5-6).

- Identify likely causes of erosion and potential measures to rectify causes of headcutting in the lower portion of the creek.

5.1.3 Central San Juan & Trampas Canyon Sub-basin

The Central San Juan & Trampas Canyon sub-basin is divided into two main geographic areas: the Central San Juan subunit and the Trampas Canyon subunit. The Central San Juan subunit

includes the reach of San Juan Creek from just south of the confluence with Bell Creek to the east and the confluence with Gobernadora Creek to the west. The Central San Juan subunit extends north from San Juan Creek approximately 1.6 miles and encompasses a large north-south trending canyon through the center of the subunit. The Trampas Canyon subunit is characterized by the silica sand mining operation that dominates the canyon and the rugged terrain between Cristianitos Canyon and San Juan Creek.

5.1.4 Central San Juan Subunit

a. Planning Considerations - Existing Conditions and Biological Resources

- Soils in the subunit generally include erodable silts and erodable clays on the uplands north of San Juan Creek and alluvial deposits in San Juan Creek.

- Elevations in the subunit range from approximately 200 feet above sea level in San Juan Creek to about 870 feet at the boundary with Caspers Wilderness Park.

- The subunit is approximately 5.5 miles from the Pacific Coast.

- Upland habitats include coastal sage scrub, chaparral, oak woodlands, grassland, agriculture and disturbed areas (Colorspot Nursery).

- Approximately 13-14 California gnatcatcher locations occur in the coastal sage scrub habitat north of the nursery.

- Gnatcatchers may use coastal sage scrub adjacent to San Juan Creek, and this habitat probably is important for dispersal.

- Upland terraces immediately adjacent to the creek provide foraging and estivation habitat for the arroyo toad.

- Other sensitive species in uplands include cactus wren, rufous-crowned sparrow, grasshopper sparrow, San Diego desert woodrat, orange-throated whiptail, coastal western whiptail, northern red-diamond rattlesnake, San Diego ringneck snake, California glossy snake, and western skink. Sandy soils in and adjacent to San Juan Creek provide suitable habitat for the silvery legless lizard.

- A breeding colony of tricolored blackbirds has been observed in the past in San Juan Creek east of the intersection of Ortega Highway and Cristianitos Road.

- Uplands support locations of many-stemmed dudleya, intermediate mariposa lily, Catalina mariposa lily and Palmer's grapplinghook. As described above, the many-

stemmed dudleya and intermediate mariposa lily locations, in combination with the Gobernadora sub-basin locations, comprise *major populations* of these species.

- A small portion of the San Juan Creek *major population* of the arroyo toad occurs in central San Juan Creek extending from about 1,600 feet south of the confluence of Bell, Verdugo and San Juan creeks to about 1,000 feet east of the Antonio Parkway bridge (in the Chiquita Canyon sub-basin). Surveys in this reach have yielded persistent, but relatively small, population counts for the toad. (Note: Bloom [1998] mapped potential habitat to an area about 3,000 feet downstream of Antonio Parkway bridge, but toads have not been observed farther west than about the confluence with Chiquita Creek.) This portion of the San Juan Creek *major population* is not considered a *key location* for at least three reasons: (1) the viability of the upstream *key locations* in Upper San Juan Creek and Bell Canyon are not reliant on this small downstream population, (2) recent breeding has been limited to an area just downstream of Trampas Canyon supported by an artificial runoff source; and (3) the proliferation of arundo in this reach of San Juan Creek has contributed to the ongoing degradation of toad habitat.

- Riparian and aquatic habitats within the creek provide breeding habitat for least Bell's vireo as well as yellow-breasted chat, yellow warbler, white-tailed kite, Cooper's hawk, red-shouldered hawk, great-horned owl, barn owl, red-tailed hawk, great blue heron, southwestern pond turtle, two-striped garter snake, western spadefoot toad, arroyo chub and threespine stickleback.

- The subunit is a key connection, especially for movement between the northern and southern portions of the subregion. It provides continuous upland habitat linkage connections, particularly along the southern side of the creek, for species such as the California gnatcatcher, cactus wren, rufous-crowned sparrow, and a variety of reptiles and small mammals. Large- and medium-sized mammals known or expected to use the riparian habitat as "live-in" habitat and for movement include mountain lion, mule deer, bobcat, coyote, and gray fox.

- North-south movement of large wildlife between San Juan Creek and Trampas Canyon and Cristianitos Canyon currently is constrained by Ortega Highway. High traffic volumes on Ortega Highway contribute to wildlife mortality. Wildlife have been documented to use two wildlife corridors that cross under the highway; a corrugated steel pipe culvert near Radio Tower Road and a concrete box culvert west of Cristianitos Road connecting to Trampas Canyon.

b. Planning Recommendations

1. Protection Recommendations

- Maintain and manage riparian and aquatic habitats along San Juan Creek for breeding populations of the arroyo toad, least Bell's vireo, and other sensitive species such as yellow warbler, yellow-breasted chat, raptors, southwestern pond turtle, two-striped garter snake, western spadefoot toad, silvery legless lizard, arroyo chub and threespine stickleback.

- Provide upland foraging and estivation habitat within the upland terraces in the floodplain of San Juan Creek, with a particular focus on the south side of the creek, to maintain existing population levels of the arroyo toad.

- Protect upland habitat adjoining riparian and aquatic habitats to support nesting sites of southwestern pond turtle.

- Protect upland habitat adjoining riparian and aquatic habitats to support all life stages of western spadefoot toad.

- Protect breeding habitat and, to the extent feasible, protect foraging habitat for raptors adjacent to San Juan Creek.

- Provide floodplain and upland habitat linkages adjacent to San Juan Creek for east-west and north-south dispersal by the California gnatcatcher between the Chiquita Canyon and Cristianitos sub-basins.

- Provide a habitat linkage at the confluences of Verdugo Canyon and Bell Canyon with San Juan Creek. Maintain an adequate habitat linkage along central San Juan Creek for "live-in" dispersal and movement habitat for terrestrial species, including mountain lion, bobcat, coyote and mule deer between sub-basins and especially between Chiquita Ridge, Canada Gobernadora, Bell Canyon, upper San Juan Creek, Verdugo Canyon, Trampas Canyon and Cristianitos Canyon.

- Address the potential to improve north-south movement of large wildlife between San Juan Creek and Trampas Canyon and Cristianitos Canyon by assessing the benefits and feasibility of relocating Ortega Highway to the north side of San Juan Creek.

2. Management Recommendations

- Implement a bullfrog eradication program for the Cal-Mat Lake within San Juan Creek to help protect arroyo toads.

- Implement a management program for protected sensitive plant locations in the sub-basin, including control of non-native invasive species, management of grazing as part of the adaptive management program, and prevention of human disturbance. The management recommendations for plants are described more fully in Section 4.

3. Restoration Recommendations

- In coordination with upstream eradication efforts, implement an arundo removal program for San Juan Creek within Rancho Mission Viejo boundaries to protect arroyo toad habitat and other riparian areas.

- Translocate salvaged many-stemmed dudleya to CSS/VGL restoration and enhancement areas where feasible and appropriate. Potential restoration and enhancement areas in the sub-basin include Chiquadora Ridge. Receiver areas should support clay soils suitable for many-stemmed dudleya and should be placed in locations that maximize connectivity and genetic exchange.

- Salvage clay topsoils from development areas where feasible and appropriate and transport to restoration areas. Salvaged topsoils may be used to create additional suitable dudleya habitat and may contain seedbank.

- Translocate salvaged intermediate mariposa lily bulbs to areas where suitable soil conditions occur. Specific translocation areas have not been identified, but based on the existing distribution, potential general translocation areas in the sub-basin area include Chiquadora Ridge.

- Initiate an intermediate mariposa lily seed collection program in 2003 if sufficient rain falls to warrant the collection program. Receiver sites should be identified in the winter of 2003 and a pilot planting program should be implemented to determine the effectiveness of propagation by seed.

5.1.5 Trampas Canyon Subunit

a. Planning Considerations - Existing Conditions and Resources

- Sand, hard rock and minerals have been mined from Trampas Canyon over the past 50 years. An artificial lake dominates this sub-basin. The lake is steep-sided, relatively deep and the uplands surrounding it are dominated by ruderal vegetation.

- The Trampas Canyon silica mining activities have resulted in the creation of an 88-acre temporary storage facility/artificial wetland. Cessation of mining activity will result in the elimination of the hydrologic conditions that created this feature.

- Soils in the subunit are comprised of mainly silty-sandy soils similar to those found in the Chiquita Canyon and Gobernadora sub-basins. Smaller areas in the eastern portion of the subunit are underlain by clayey silts and sands.

- Elevations in the subunit range from approximately 300 feet above sea level at Ortega Highway to more than 1,000 feet along Radio Tower Road at the western boundary of the subunit.

- The western boundary of the subunit is approximately 5.5 miles from the Pacific Coast.

- The subunit supports a mosaic of upland habitats, including coastal sage scrub, chaparral, grassland, and patches of oak woodland.

- The subunit supports approximately four California gnatcatcher locations and approximately 20 cactus wren locations. Two of the four gnatcatcher locations are in the western portion of the subunit adjacent to the Chiquita Canyon sub-basin and the other two are in the southeastern portion of the subunit adjacent to the Cristianitos sub-basin. Both sets of gnatcatcher locations are a part of *important populations* in *key locations* and provide important connectivity function.

- The subunit is used by mule deer and mountain lions.

- Raptors nesting in oak woodlands in the subunit include turkey vulture, white-tailed kite, Cooper's hawk, red-shouldered hawk, red-tailed hawk, and great horned owl.

- Vernal pools along Radio Tower Road south of Ortega Highway (pools 7 and 8) appear to be associated with localized bedrock landslides from the San Onofre and Monterey formations. Vernal pool 7 supports both the Riverside fairy shrimp and San Diego fairy shrimp. The spadefoot toad also breeds in these vernal pools.

- The subunit also supports slope wetlands along Radio Tower Road that also appear to be associated with localized bedrock landslides from the San Onofre and Monterey formations.

- Other sensitive wildlife species known from the subunit include orange-throated whiptail, red-diamond rattlesnake, and San Diego desert woodrat near the mouth of the canyon.

- The southern portion of the subunit, in conjunction with the Cristianitos sub-basin, supports a *major population* of the many-stemmed dudleya in a *key location*. The Trampas Canyon subunit itself supports about eight locations of 20-700 individuals each.

- The southern portion of the Trampas Canyon subunit supports eight locations of intermediate mariposa lily, with one population numbering 640 individuals, and the

others numbering less than 50 individuals. These locations may be considered an *important population* because they contribute to the geographic diversity of the species in the subregion.

- Although the riparian vegetation in the subunit does not provide high value breeding habitat for species such as the least Bell's vireo and other sensitive, non-raptor riparian birds, the reservoir provides resting and foraging habitat for common water fowl and other birds associated with open water and wetland vegetation such as pied-billed grebe, western grebe, mallard, ruddy duck, ring-necked duck, double-crested cormorant, herons, and American coot.

- Coastal sage scrub in the central portion of the subunit provides a nearly continuous north-south connection between San Juan Creek and the upper portion of the Cristianitos sub-basin for bird species such as the California gnatcatcher and cactus wren. This portion of the subunit east of Trampas Creek, along with the Cristianitos Canyon sub-basin, connects populations to the north in Chiquita Canyon with the Camp Pendleton population south of the subregion.

- The central portion of the subunit east of the mine and Cristianitos Road is also a habitat linkage between San Juan Creek and Cristianitos, Blind, La Paz, and Gabino canyons used by mountain lion, mule deer, coyote, and bobcat. A concrete box culvert crossing of Ortega Highway just west of Cristianitos Road is a key crossing point for wildlife between San Juan Creek and Trampas Canyon.

- North-south movement of large wildlife between San Juan Creek and Trampas Canyon and Cristianitos Canyon currently is constrained by Ortega Highway. High traffic volumes on Ortega Highway contribute to wildlife mortality. Wildlife have been documented to use two wildlife corridors that cross under the highway; a corrugated steel pipe culvert near Radio Tower Road and a concrete box culvert west of Cristianitos Road connecting to Trampas Canyon.

b. Planning Recommendations

1. Protection Recommendations

- Protect the vernal pools and their contributing hydrologic sources, Riverside fairy shrimp and San Diego fairy shrimp, as well as the slope wetlands and their primary sub-surface water supply recharge characteristics along Radio Tower Road.

- Avoid impacts to the *important populations* of California gnatcatchers and coastal sage scrub to the maximum extent feasible to maintain resident and dispersal habitat for the gnatcatcher between San Juan Creek and Cristianitos Canyon and populations on Camp Pendleton.

- Maintain upland north-south habitat linkages through the central and western portions of the Trampas Canyon subunit to convey wildlife movement and dispersal (especially gnatcatchers) between San Juan Creek, San Juan Capistrano, San Clemente, Cristianitos Canyon, the Donna O'Neill Conservancy at Rancho Mission Viejo and Camp Pendleton.

- Maintain upland east-west habitat linkage/wildlife corridor south of the artificial lake to link Prima Deshecha, Talega Open Space and other habitat to the west in San Juan Capistrano and San Clemente with the Donna O'Neill Conservancy and the Gabino, La Paz and Talega movement corridors. This habitat linkage should allow for dispersal of gnatcatchers and other avian species, as well as provide a movement corridor for large mammals such as bobcat, coyote, and mule deer.

- Address the potential to improve north-south movement of large wildlife between San Juan Creek and Trampas Canyon and Cristianitos Canyon by assessing the benefits and feasibility of relocating Ortega Highway to the north side of San Juan Creek.

- Maintain and manage riparian and aquatic habitats along San Juan Creek for arroyo toad, least Bell's vireo, and other sensitive species such as yellow warbler, yellow-breasted chat, raptors, southwestern pond turtle, two-striped garter snake, western spadefoot toad, silvery legless lizard, arroyo chub and threespine stickleback.

- Protect upland terraces and habitat adjoining San Juan Creek to support arroyo toad foraging and estivation.

- Protect the Trampas Canyon subunit component (approximately eight discrete locations) of the *major population* of many-stemmed dudleya that extends from the southern portion of the Trampas Canyon in the north, through the Cristianitos Canyon sub-basin south to the Talega development open space located in the San Clemente Watershed.

- Protect the eight known locations of intermediate mariposa lily comprising an *important population* in the subunit.

2. Management Recommendations

- Maintain stormwater flow characteristics comparable to existing conditions from Trampas Canyon into San Juan Creek to preserve breeding habitat for the arroyo toad population and other aquatic species in San Juan Creek.

- Implement a management program for protected sensitive plant locations in the sub-basin, including control of non-native invasive species, management of grazing as part of the adaptive management program, and prevention of human disturbance. The management recommendations for plants are described more fully in Section 6.

5.1.6 Verdugo Canyon Sub-basin

a. Planning Considerations - Existing Conditions and Resources

- Soils in the sub-basin are characterized by highly erodable silts and clays, with a coarse substrate in the streambed.

- Elevations range from approximately 400 feet above sea level at the confluence with San Juan Creek to approximately 1,800 feet at the Riverside County boundary.

- The sub-basin is approximately 8.5 miles from the Pacific Coast.

- The sub-basin is bordered by grasslands, coastal sage scrub, and small patches of oak woodland. Coastal sage scrub and chaparral are the predominant habitats, with the grasslands more prominent toward the canyon's confluence with San Juan Creek.

- The sub-basin supports sycamore riparian woodland and southern coast live oak riparian forest, with small patches of mule fat scrub. Southern willow scrub is present in tributaries to Verdugo Canyon.

- One California gnatcatcher and approximately 16 cactus wren locations occur in the coastal sage scrub along the canyon.

- The yellow-breasted chat occurs in riparian habitat in the sub-basin.

- Riparian habitat in the sub-basin supports nest sites for Cooper's hawk, red-shouldered hawk, red-tailed hawk, and barn owl.

- There is an historic record of a small breeding colony of the tricolored blackbird at the mouth of the canyon under the Ortega Highway bridge.

- The sub-basin provides a habitat connection for large- and medium-sized mammals. Mule deer are common in the canyon, and it provides habitat for mountain lion, coyote, bobcat, and gray fox.

- The sub-basin is central to the large block of relatively undisturbed habitat in the eastern part of the subregion.

b. Planning Recommendations

1. Protection Recommendations

- Protect, to the extent feasible, patches of coastal sage scrub and patches of southern cactus scrub that support cactus wren with a focus on maintaining contiguous habitat patches that provide north-south dispersal opportunities for the cactus wren and other species between the Lucas Canyon sub-basin to the north, and the Gabino Canyon/Blind Canyon and La Paz sub-basins to the south.

- Maintain habitat connectivity for movement of large mammals such as mountain lion, bobcat, coyote and mule deer between San Juan Creek and Cleveland National Forest; and between upper Verdugo Canyon and the headwaters of Gabino Creek.

- Protect riparian habitat that provides nest sites for Cooper's hawk, red-tailed hawk, red-shouldered hawk and barn owl.

- Protect grassland and wetland/riparian habitat at the mouth of Verdugo Canyon near Ortega Highway to retain tricolored blackbird habitat and to provide for wildlife movement to San Juan Creek.

- Protect Verdugo Canyon hydrology to maintain sources of coarse sediment that are important for arroyo toad breeding habitat in downstream areas.

5.2 San Mateo Creek Watershed

Figures 5-7 through 5-11 provide planning species maps for coastal sage scrub, riparian/aquatic habitat, historic raptor nest sites, grassland, and plants, respectively, for the San Mateo Creek Watershed.

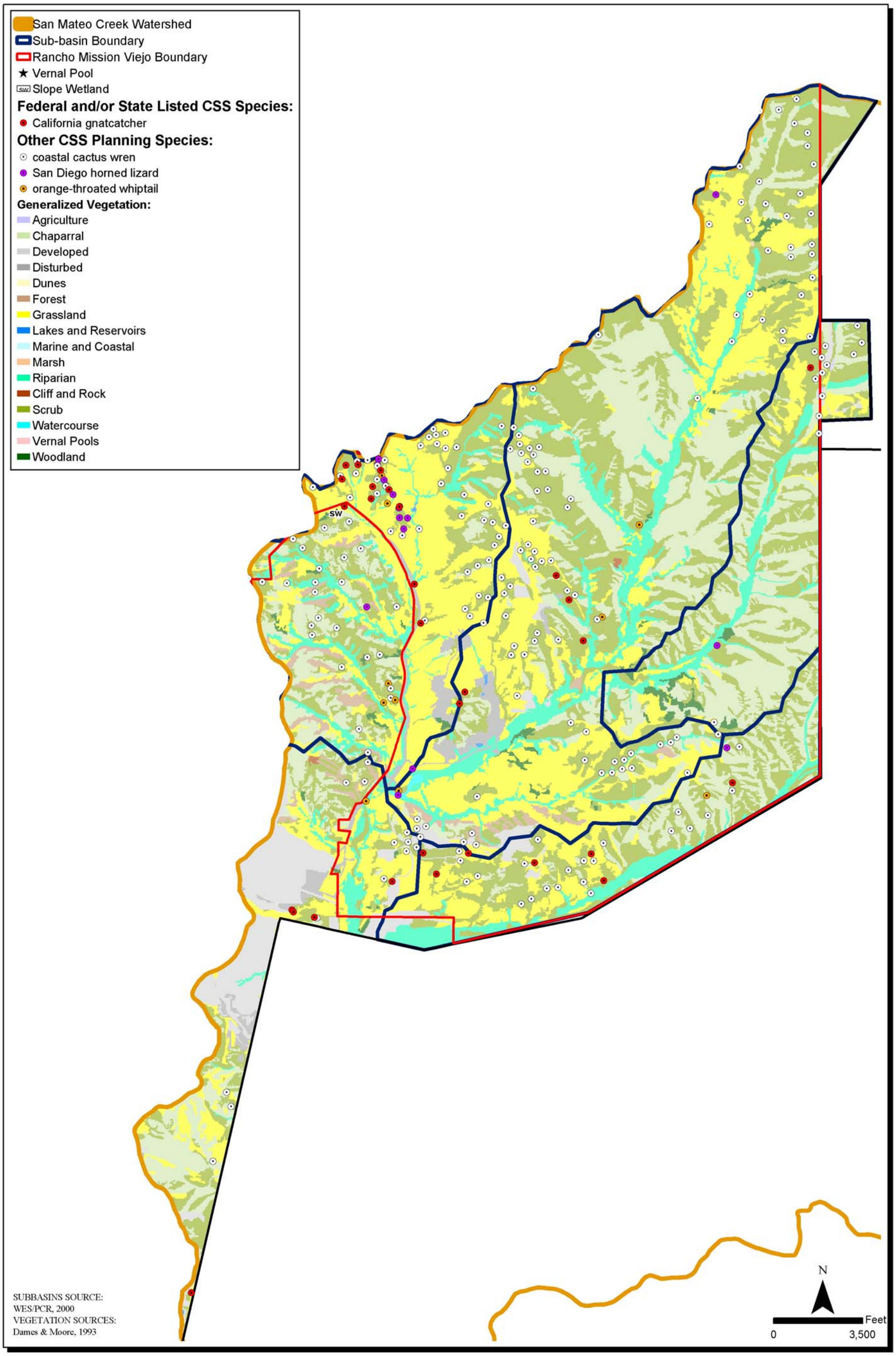
5.2.1 Cristianitos Canyon Sub-basin

a. Planning Considerations - Existing Conditions and Resources

- Soils west of the creek are characterized by erodable silty sands while soils east of the creek generally are clays.

- Elevations in the sub-basin range from approximately 280 feet above sea level at the confluence of Cristianitos and Gabino creeks to 1,000 feet at the head of Cristianitos Canyon.

- The sub-basin is approximately 5 miles from the Pacific Coast.



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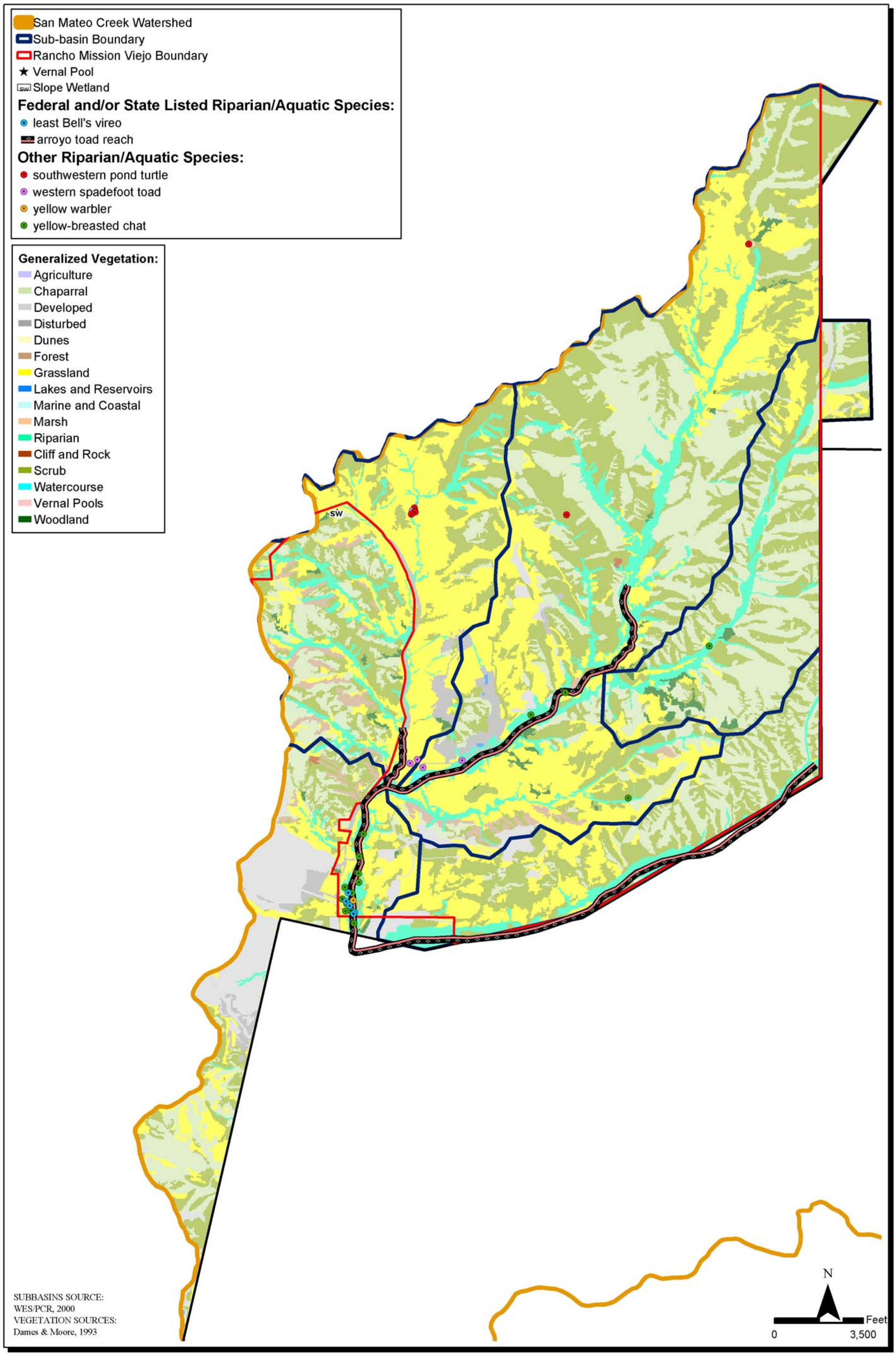
San Mateo Creek Watershed - Coastal Sage Scrub Wildlife Species

FIGURE 5-7



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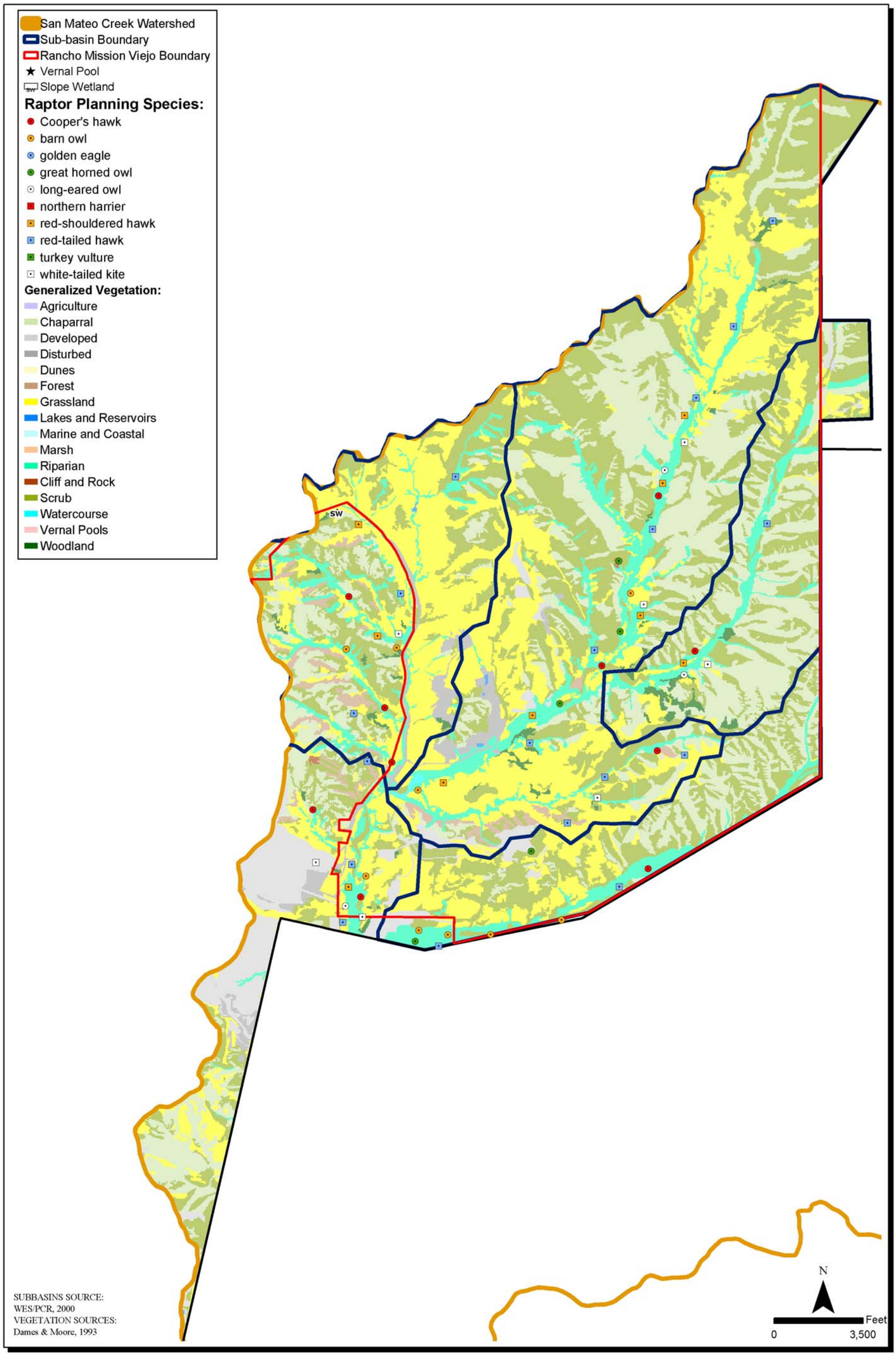
San Mateo Creek Watershed - Riparian/Aquatic Wildlife Species

FIGURE 5-8



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San Mateo Creek Watershed - Historic Raptor Nest Sites

FIGURE 5-9

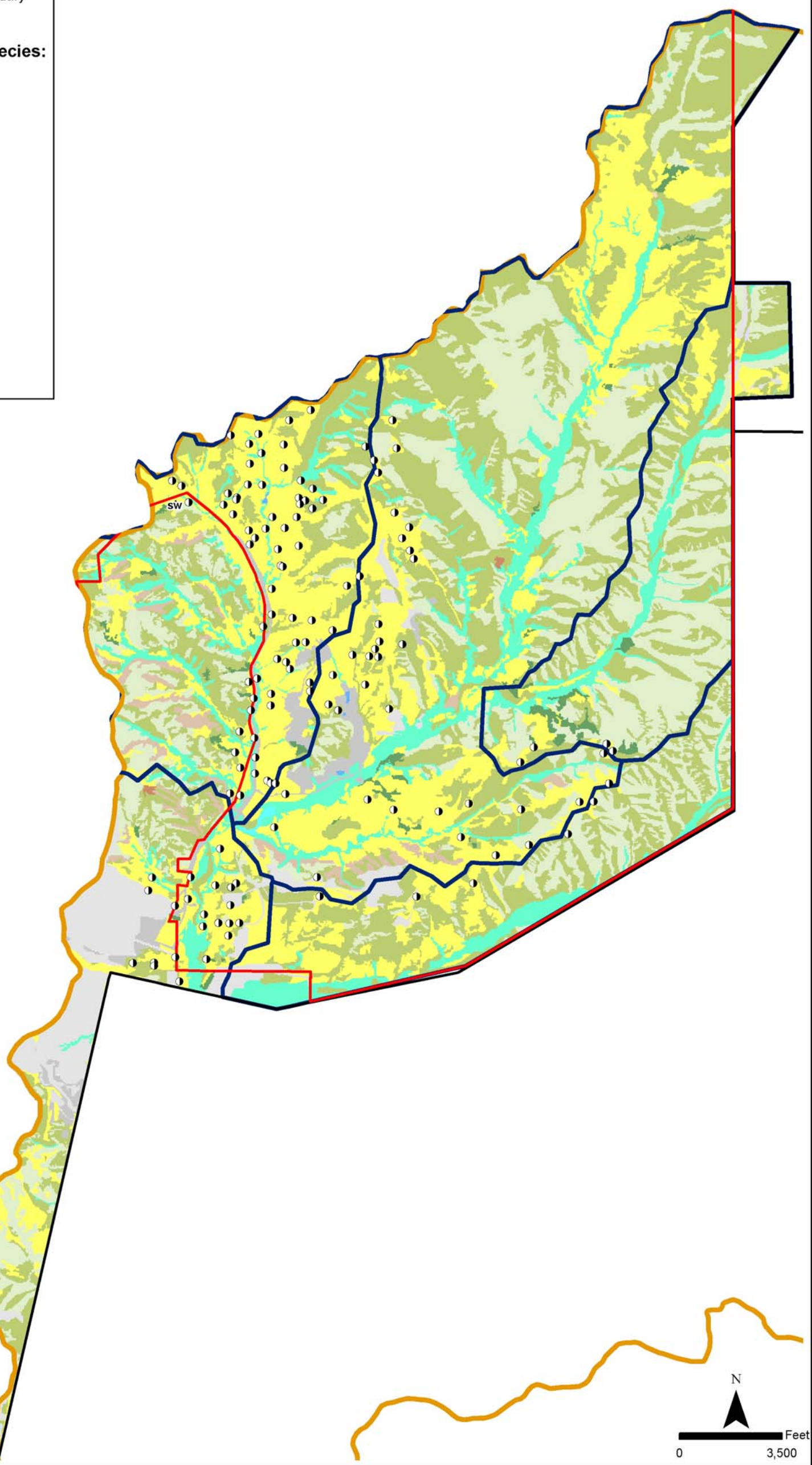
San Mateo Creek Watershed
Sub-basin Boundary
Rancho Mission Viejo Boundary
★ Vernal Pool
SW Slope Wetland

Grassland Planning Species:

◑ grasshopper sparrow

Generalized Vegetation:

- Agriculture
- Chaparral
- Developed
- Disturbed
- Dunes
- Forest
- Grassland
- Lakes and Reservoirs
- Marine and Coastal
- Marsh
- Riparian
- Cliff and Rock
- Scrub
- Watercourse
- Vernal Pools
- Woodland



SUBBASINS SOURCE:
WES/PCR, 2000
VEGETATION SOURCES:
Dames & Moore, 1993

N

Feet
0
3,500

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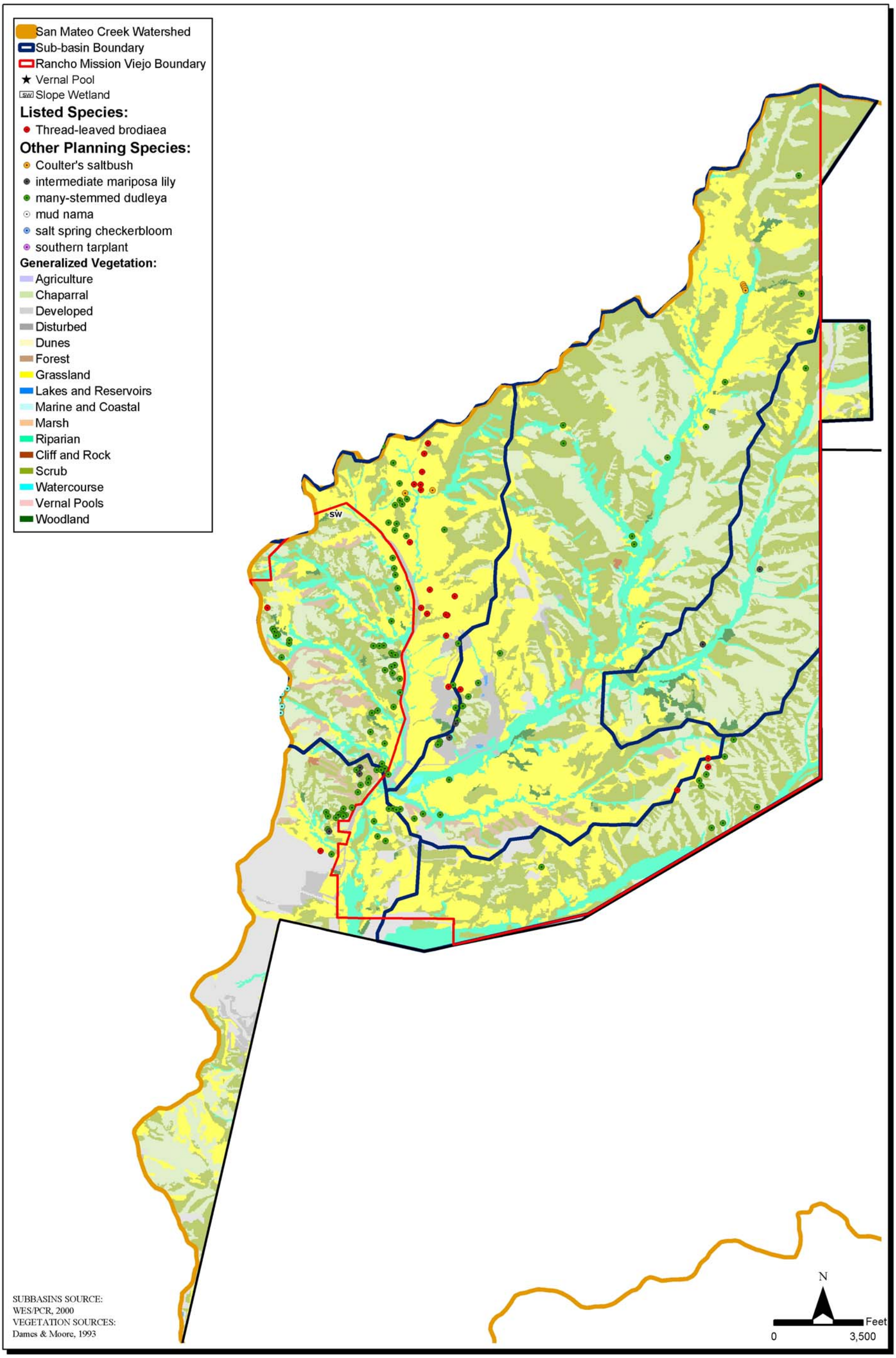
San Mateo Creek Watershed - Grassland Wildlife Species

FIGURE
5-10



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San Mateo Creek Watershed - Plant Planning Species

FIGURE 5-11

The sub-basin is dominated by grasslands, a large component of which is native grassland (330 acres), and coastal sage scrub. The grassland is predominant in upper Cristianitos and along the eastern side of the canyon, while coastal sage scrub and chaparral dominate the east-facing slopes on the western side of the canyon within the Donna O'Neill Land Conservancy.

- Riparian habitats in the sub-basin include coast live oak riparian woodland, southern willow scrub and mule fat. Mule fat is a predominant component in the upper portion of the sub-basin. Tributaries to Cristianitos Creek from the Donna O'Neill Land Conservancy support coast live oak woodland and riparian woodland.

- The sub-basin supports approximately 12 California gnatcatcher locations and approximately 67 cactus wren locations. The 12 gnatcatcher locations, in combination with the two adjacent locations in the Trampas Canyon subunit, comprise an *important population* in a *key location*.

- Other upland sensitive species in the sub-basin include grasshopper sparrow, rufous-crowned sparrow, California horned lark, San Diego horned lizard, coastal western whiptail, orange-throated whiptail, western patch-nosed snake, northern red-diamond rattlesnake, and San Diego desert woodrat.

- The segment of Cristianitos Creek upstream of the confluence with Gabino Creek is part of the Lower Cristianitos Creek/Lower Gabino Creek arroyo toad *important population.* The segment of Cristianitos Creek north of the confluence with Gabino Creek is the transition zone between clay terrains that typify the substrate of the streamcourse in Upper Cristianitos Creek and sandy terrains that typify the substrate of the streamcourse below its confluence with Gabino Creek (i.e. Lower Cristianitos Creek). The creek habitat in this reach is considered marginal for breeding because of the fine sediments in the streamcourse and is peripheral to considerably more suitable breeding habitat downstream of the confluence with Gabino Canyon and within lower Gabino Canyon. Several surveys have only documented toads (5) in 2001 in this segment of Cristianitos Creek and they were only observed adjacent to the creek. There was no evidence that the toads were breeding in this segment of the creek. For these reasons, the segment of Cristianitos Creek upstream of the confluence with Gabino Creek is not considered part of the *key location* within the Lower Cristianitos Creek/Lower Gabino Creek *important population*.

- Riparian and aquatic sensitive species in the sub-basin include white-tailed kite, Cooper's hawk, red-shouldered hawk, red-tailed hawk, great horned owl, barn owl, southwestern pond turtle, and western spadefoot toad. The pond turtle and spadefoot toad both occur in the stockpond along Cristianitos Creek in the upper portion of the sub-basin. The spadefoot toad also occurs in the southern part of the sub-basin just north of the confluence of Cristianitos and Gabino creeks.

- The grasslands provide foraging habitat for sensitive wintering raptors such as the ferruginous hawk and Swainson's hawk. Wintering burrowing owls also have been recorded in Cristianitos Canyon.

- A location with 2,000-3,000 flowering stalks of thread-leaved brodiaea occurs on the hill outcrop adjacent to the mine pits in the southern portion of Cristianitos Canyon on the boundary between the Cristianitos and Gabino and Blind Canyons sub-basins. As one of the two largest populations on RMV property, this is a *major population* in a *key location* (the other *major population* is located on Chiquadora Ridge).

- About 14-15 other separate, scattered locations of thread-leaved brodiaea occur in the Cristianitos sub-basin, ranging from one to 120 flowering stalks. These are *important populations* because they potentially provide connectivity between offsite locations to the south in San Onofre State Park and Camp Pendleton to the south with planning area locations to the north (e.g., Chiquadora Ridge).

- A *major population* of many-stemmed dudleya is located in the Cristianitos sub-basin and the southern portion of the Trampas Canyon subunit, extending south to the Talega development in the San Clemente Watershed and eastward into the western portion of the Lower Gabino and Blind Canyons sub-basin. This population occurs on both RMV land and the Donna O'Neill Conservancy and extends into Talega Open Space.

- Cristianitos Canyon within the Donna O'Neill Conservancy supports five locations of intermediate mariposa lily of unknown size (data base has population size of 1). These locations may be considered *important populations* because they contribute to the geographic diversity of the species in the subregion.

- Upper Cristianitos Creek supports two small locations of Coulter's saltbush numbering three and 12 individuals, respectively. This is an *important population* because of the rarity of this species in the region.

- The sub-basin contains clay soils that support other sensitive plants including the Palmer's grapplinghook and western dichondra.

- The sub-basin supports Catalina mariposa lily within clay and non-clay soils.

- The sub-basin probably serves as a primary north-south dispersal area for the California gnatcatcher between the large populations in Chiquita Canyon and Camp Pendleton.

- In combination with Talega, Gabino and La Paz canyons, the Cristianitos Canyon sub-basin provides a habitat connection for the mountain lion, mule deer, bobcat, coyote and gray fox to adjoining sub-basins.

b. Planning Recommendations

1. Protection Recommendations

- Protect a habitat linkage, consisting of the Donna O'Neill Land Conservancy and an area along the east side of Cristianitos Creek, to provide connectivity for gnatcatchers in the upper portion of the sub-basin with other populations in lower Gabino Creek and Camp Pendleton along lower Cristianitos/San Mateo Creek, and to maintain habitat integrity through connectivity within the Donna O'Neill Land Conservancy at Rancho Mission Viejo.

- Protect appropriate wetland and upland habitats to support a nesting population of the southwestern pond turtle, which occurs in the upper portion of the watershed in a small stockpond along Cristianitos Creek.

- Protect wetlands and adjoining upland habitat to support all life stages of western spadefoot toad.

- Avoid riparian/wetland habitat, including alkali wetlands, to the maximum extent feasible.

- Protect the majority of native grasslands in the sub-basin.

- Protect breeding habitat and, to the extent feasible, foraging habitat for resident and wintering raptor species.

- Protect the majority of the cactus wren locations within the sub-basin.

- Maintain a north-south habitat linkage along Cristianitos Creek between San Juan Creek and lower San Mateo Creek for dispersal and movement of gnatcatchers and other avian species, as well as large mammals such as mountain lion, bobcat, coyote, and mule deer, and, in particular, avoid occupied coastal sage scrub habitat in upper Cristianitos Canyon.

- Maintain an east-west habitat linkage from Gabino Creek to the confluence with Cristianitos Creek for wildlife movement between Gabino Canyon and the Donna O'Neill Conservancy at Rancho Mission Viejo.

- Protect the location supporting approximately 2,000-3,000 flowering stalks of thread-leaved brodiaea on the hill outcrop adjacent to the clay mine pits in the southern portion of Cristianitos Canyon. This location meets the criteria for a *major population* in a *key location*.

- Protect 10 of the 14 small, scattered locations of thread-leaved brodiaea in Cristianitos Canyon, totaling approximately 300 flowering stalks, to achieve the objective of protecting *important populations* in *key locations*. Maintain a continuous habitat connection between these scattered populations to allow for interactions and genetic exchange between the populations. These locations provide a linkage between other brodiaea locations in the area and the area has good potential for enhancement and restoration.

- Protect the *major population* of many-stemmed dudleya extending from the southern portion of the Trampas Canyon subunit in the north, through the Cristianitos Canyon sub-basin south to the Talega development open space located in the San Clemente Watershed. This area supports the largest *major population* in the subregion with approximately 19,300 individuals in about 69 discrete locations.

- Protect the two known *important populations* of Coulter's saltbush in the sub-basin.

2. Management Recommendations

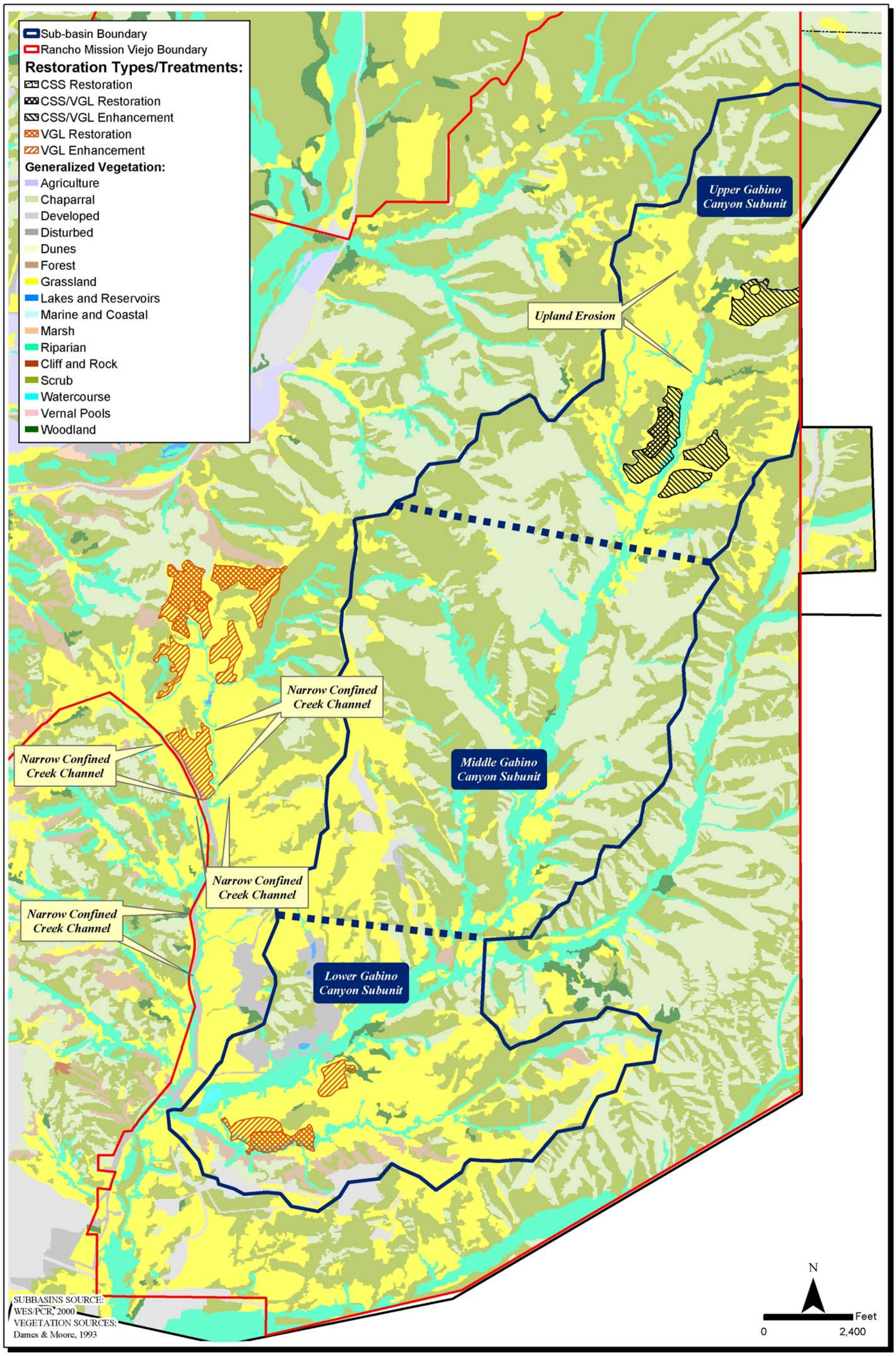
- Pursuant to the Grazing Management Plan, implement grazing management techniques to help protect listed and other selected species and habitat, promote perennial grasses including native grasses, allow for continued cattle grazing sufficient to support cattle ranching operations, and, where appropriate reduce fuel loads for fire.

- Implement a management program for protected sensitive plant locations in the sub-basin, including control of non-native invasive species, management of grazing as part of the adaptive management program, and prevention of human disturbance. The management recommendations for plants are described more fully in Section 4.

3. Restoration Recommendations

- Implement a native grasslands restoration program, which will likely include grazing grassland restoration techniques set forth in the Grazing Management Plan, for the upper portion of the sub-basin (Figure 5-12).

- Translocate salvaged thread-leaved brodiaea and many-stemmed dudleya to CSS/VGL restoration and enhancement areas where feasible and appropriate. Potential restoration and enhancement areas in the sub-basin include upper Cristianitos Canyon and the southern portion of the Trampas Canyon subunit. Receiver areas should support clay soils suitable for brodiaea and dudleya, and should be placed in locations that maximize connectivity and genetic exchange.



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CSS/VGL and Creek Restoration Areas for Cristianitos and Gabino & Blind Canyons Sub-basin

FIGURE 5-12

- Salvage clay topsoils from development areas where feasible and appropriate and transport to restoration areas. Salvaged topsoils may be used to create additional suitable brodiaea and dudleya habitat and may contain seedbank.

- Translocate salvaged intermediate mariposa lily bulbs to areas where suitable soil conditions occur. Specific translocation areas have not been identified, but based on the existing distribution, potential general translocation areas in the sub-basin area include upper Cristianitos Canyon and the southern portion of the Trampas Canyon subunit.

- Initiate an intermediate mariposa lily seed collection program in 2003 if sufficient rain falls to warrant the collection program. Receiver sites should be identified in the winter of 2003 and a pilot planting program should be implemented to determine the effectiveness of propagation from seed.

- Protect the upper watershed headwaters, address erosion from the clay pits and implement creek stabilization actions to address localized erosion presently causing increases in fine sediment yields in Upper Cristianitos Creek per the "Watershed and Sub-Basin Planning Principles" (Figure 5-12).

5.2.2 Gabino and Blind Canyons Sub-basin

The Gabino and Blind Canyons sub-basin is divided into three main planning subunits: the upper Gabino Canyon subunit, the middle Gabino Canyon subunit and the lower Gabino Canyon subunit including Blind Canyon. The upper Gabino Canyon subunit encompasses the open grasslands at the headwaters of Gabino Creek. The middle Gabino Canyon subunit is defined by the narrow, steep-sided canyon between upper Gabino Canyon and the confluence of Gabino and La Paz creeks. The lower Gabino Canyon subunit includes the portion of Gabino Canyon below its confluence with La Paz Creek and its confluence with Cristianitos Creek.

5.2.3 Upper Gabino Subunit

a. Planning Considerations - Existing Conditions and Resources

- Soils in the subunit are dominated by erodable clays, with smaller areas of erodable silts.

- Elevations in the subunit range from approximately 600 feet in the valley floor to 1,500 at the Riverside County boundary.

- The subunit is approximately 10 miles from the Pacific Coast.

- The open "bowl-shaped" portion of the subunit adjacent to upper Gabino Creek is characterized by predominantly native grasslands on the gentle slopes leading away from

the creek, with coastal sage scrub and chaparral dominating the surrounding rugged canyons and hills.

- The riparian habitat in the subunit includes relatively open coast live oak riparian woodland, sycamore riparian woodland, and mule fat.

- While the population is not as dense as other areas within the planning area, numerous cactus wren locations are present in the subunit.

- The grassland in the subunit is high quality raptor foraging habitat and also provides habitat for the badger, burrowing owl, spadefoot toad and horned lark.

- The riparian habitat in the subunit supports a few raptor nest sites for white-tailed kite, red-shouldered hawk and red-tailed hawk, but not at the density of the downstream riparian habitats in middle Gabino Canyon where the canyon is narrow and closely bounded by rugged terrain.

- Aquatic habitat (Jerome's Lake) in the subunit supports the southwestern pond turtle and two-striped garter snake.

- Upper Gabino, in association with middle Gabino and upper La Paz canyons, supports several locations of many-stemmed dudleya ranging from about five individuals to about 1,500 individuals, and cumulatively totaling more than 3,500 individuals. These locations comprise a *major population* in a *key location*.

- A small population of about 100 individuals of Coulter's saltbush occurs west of and adjacent to the creek. This is an *important population* because of the rarity of this species in the region.

- The subunit supports a large population of western dichondra.

b. Planning Recommendations

1. Protection Recommendations

- Protect a habitat linkage along Upper Gabino to allow dispersal of large mammals.

- Maintain contiguity and connectivity of coastal sage scrub to provide dispersal habitat for the cactus wren and other sensitive coastal sage scrub species.

- Minimize, to the extent feasible, impacts to grassland foraging habitat for resident and wintering raptors, as well as "live-in" habitat for several other wildlife species that

potentially occur in the subunit, including grasshopper sparrow, wintering burrowing owls, badger, spadefoot toad and horned lark.

- Protect Jerome Lake and surrounding uplands to maintain nesting habitat for the southwestern pond turtle.

- Protect the majority of native grasslands within the subunit. Manage and restore protected native grasslands in accordance with the management and restoration recommendations described below, including grazing management techniques .

- Protect the approximately six known discrete locations of many-stemmed dudleya in the subunit that are part of the *major population* in a *key location*.

- Protect the *important population* of Coulter's saltbush in the subunit.

2. Management Recommendations

- Implement a management program for protected sensitive plant locations in the sub-basin, including control of non-native invasive species, management of grazing as part of the adaptive management program, and prevention of human disturbance. The management recommendations for plants are described more fully in Section 4.

- Pursuant to the Grazing Management Plan, implement grazing management techniques to help protect listed and other selected species and habitat, promote perennial grasses including native grasses, allow for continued cattle grazing sufficient to support cattle ranching operations, and, where appropriate reduce fuel loads for fire.

3. Restoration Recommendations

- Implement a CSS/VGL restoration and enhancement program, which will likely include grazing grassland restoration techniques set forth in the Grazing Management Plan (Figure 5-12).

- Translocate any impacted many-stemmed dudleya to CSS/VGL restoration and enhancement areas in upper Gabino where feasible and appropriate. Receiver areas should support clay soils suitable for dudleya.

- Salvage clay topsoils from development areas where feasible and transport to restoration areas. Salvaged topsoils may be used to create additional suitable dudleya habitat and may contain seedbank.

- Implement a creek restoration program in the subunit to address erosion that is generating increases in fine sediment yields in Upper Gabino (Figure 5-12).

5.2.4 Middle Gabino Canyon Subunit

a. Planning Considerations- Existing Conditions and Resources

- Soils in the middle Gabino segment of the subunit include erodable silts on very steep slopes, with sand and cobble in the creek.

- Elevations in the subunit range from approximately 400 feet at the confluence with La Paz Creek and 1,000 feet on the ridges above the canyon.

- The western portion of the subunit is approximately 7 miles from the Pacific Coast.

- The northern two-thirds of the subunit is a narrow canyon bounded by steep, rugged slopes dominated by chaparral and smaller patches of coastal sage scrub. The lower one-third of the subunit broadens somewhat with flat benches supporting small patches of grassland.

- The riparian habitat in the subunit includes coast live oak riparian woodland, sycamore riparian woodlands, and smaller areas of coast live oak woodland and mule fat scrub. Some portions of the canyon also support floodplain (alluvial) scrub.

- Breeding sites for a small population of the arroyo toad (2 toads in 1998) extend approximately 3,000 above the confluence with La Paz Creek. This toad population is considered to be part of the *important population* in lower Gabino Creek.

- The riparian habitat supports several nest sites for raptors, including white-tailed kite, Cooper's hawk, long-eared owl, great horned owl, barn owl, and red-tailed hawk.

- The western portion of the subunit includes numerous cactus wren locations, although the population is not as dense as other areas of the planning area

- Other sensitive wildlife species in the subunit include rufous-crowned sparrow and orange-throated whiptail.

- Many-stemmed dudleya occurs in several small populations in the subunit, but in conjunction with the upper Gabino subunit and upper La Paz Canyon locations, comprise a *major population* in a *key location*.

b. Planning Recommendations

1. Protection Recommendations

- Limit impacts to ridgelines to the extent feasible in order to protect coarse sediments.

- Protect a north-south habitat linkage through Middle Gabino, with particular focus on maintaining uninterrupted riparian woodland through Middle Gabino and along the western tributary into Middle Gabino.

- Protect the arroyo toad population upstream from the confluence with La Paz Creek by avoiding impacts to breeding, foraging and estivation habitat and protect canyons to avoid downstream impacts to the toad.

- Protect the diversity of raptor nesting habitat with particular focus on retaining documented nesting habitat for white-tailed kites and long-eared owls within the subunit.

- Protect the four known discrete locations of many-stemmed dudleya in the subunit that are part of a *major population* in a *key location*.

2. Management Recommendations

- Implement a management program for protected sensitive plant locations in the sub-basin, including control of non-native invasive species, management of grazing as part of the adaptive management program, and prevention of human disturbance. The management recommendations for plants are described more fully in Section 6.

- Pursuant to the Grazing Management Plan, implement grazing management techniques that provide for long-term protection of selected species and habitat within designated reserve areas.

- Implement a management program for protected raptor nesting habitat in the sub-basin, including the minimization of human disturbance during the breeding season.

5.2.5 Lower Gabino Subunit including Blind Subunit

a. Planning Considerations - Existing Conditions and Resources

- Soils along the lower reaches of Gabino Creek and in Blind Canyon primarily are clays which generate fine sediments**.**

- Elevations in the subunit range from approximately 280 feet at the confluence of Gabino and Cristianitos creeks and 400 feet at the confluence with La Paz Creek.

- The subunit is approximately 5 miles from the Pacific Coast.

- The subunit is dominated by native and annual grasslands, with smaller patches of coastal sage scrub and oak woodlands.

- The riparian habitat in the subunit consists of southern sycamore riparian woodland, coast live oak riparian forest and woodlands, mule fat scrub and smaller areas of southern arroyo willow forest, coast live oak forest and coast live oak woodland.

- Lower Gabino Canyon supports a moderate size arroyo toad breeding population (~40 adults in 1998) between Cristianitos and La Paz creeks. This population is considered to be an *important population* in a *key location* because of its link via Cristianitos Creek with the Talega *major population*.

- The grasslands adjacent to lower Gabino Canyon provide potential upland foraging and estivation habitat for the arroyo toad.

- The subunit supports approximately five California gnatcatcher locations and numerous cactus wren locations, although the cactus wren population is not as dense as other areas of the planning area.

- Riparian habitat provides nesting sites for several raptors, including white-tailed kite, Cooper's hawk, red-tailed hawk, and great horned owl, as well as the yellow-breasted chat.

- Other sensitive wildlife species occurring in upland habitats in the subunit include grasshopper sparrow, rufous-crowned sparrow, San Diego horned lizard, orange-throated whiptail, and red-diamond rattlesnake.

- As described above for the Cristianitos sub-basin, a location with 2,000-3,000 flowering stalks of thread-leaved brodiaea occurs on the hill outcrop adjacent to the mine pits in the southern portion of Cristianitos Canyon on the boundary between the Cristianitos and Gabino and Blind Canyons sub-basins. As one of the two largest populations on RMV, this is a *major population* in a *key location.*

- The western portion of lower Gabino and Blind Canyons supports several small locations of many-stemmed dudleya, with one location numbering about 400 individuals. These locations are physically associated with the Cristianitos sub-basin population and together with these locations form a *major population*.

- Lower Gabino and Blind Canyons support two locations of intermediate mariposa lily of about 12 and 305 individuals, respectively. These locations are on the southern boundary

with Cristianitos Canyon. These locations may be considered *important populations* because they contribute to the geographic diversity of the species in the subregion.

b. Planning Recommendations

1. Protection Recommendations

- Protect breeding and foraging habitat and movement opportunities within the streamcourse and adjacent alluvial terraces for the arroyo toad. Address potential upland estivation habitat needs in the context of best scientific information regarding the influence of topography, soils and other factors that appear to influence arroyo toad lateral movement and frequency of use in upland areas away from streamcourse habitat areas.

- Protect riparian habitat for nesting yellow-breasted chat within the subunit.

- Minimize impacts to California gnatcatcher locations.

- Minimize impacts to cactus wren locations.

- Minimize impacts to native grasslands within the subunit

- Protect breeding habitat, and to the extent feasible, protect raptor foraging habitat for resident and wintering species.

- Maintain an east-west habitat linkage from Gabino Creek to the confluence with Cristianitos Creek for wildlife movement between Gabino Canyon and the Donna O'Neill Conservancy at Rancho Mission Viejo.

- Protect approximately 80 percent of the discrete many-stemmed dudleya locations in lower Gabino and Blind Canyons such that the integrity of the *major population* in this area (i.e., the combined Cristianitos and Gabino and Blind Canyons) is preserved.

- Protect the two known locations of intermediate mariposa lily in lower Gabino Canyon.

- Protect the *major population* of brodiaea in a *key location* bordering the lower Gabino Canyon sub-unit and Cristianitos Canyon sub-basin supporting approximately 2,000-3,000 flowering stalks of thread-leaved brodiaea on the hill outcrop adjacent to the clay mine pits in the southern portion of Cristianitos Canyon.

2. Management Recommendations

- Implement a management program for protected sensitive plant locations in the sub-basin, including control of non-native invasive species, management of grazing and minimization of human access and disturbance as part of the adaptive management program. The adaptive management recommendations for plants are described more fully in Section 4.

- Protect the integrity of the arroyo toad population in lower Gabino and Cristianitos creeks, as well as San Mateo Creek, by maintaining hydrologic and sediment delivery processes, including maintaining the flow characteristics of episodic events in the sub-basin.

- Implement an invasive plant species eradication effort in Cristianitos Creek between Gabino Creek and Talega Creek.

3. Restoration Recommendations

- Implement a VGL restoration and enhancement program, which will likely include grazing grassland restoration techniques set forth in the Grazing Management Plan (Figure 5-12).

5.2.6 La Paz Canyon Sub-basin

a. Planning Considerations - Existing Conditions and Resources

- Soils in the sub-basin primarily are erodable silts on steep slopes, with cobbles and boulders in the creek.

- Elevations in the sub-basin range from approximately 400 feet above sea level at the confluence with Gabino Creek to 1,000 feet at the Riverside County boundary.

- The sub-basin is approximately 7.4 miles from the Pacific Coast.

- The predominant vegetation communities in the sub-basin are coastal sage scrub and chaparral.

- Riparian habitats in the canyon include southern sycamore riparian woodland, coast live oak woodland, and mule fat scrub. The canyon bottom also supports alluvial fan (floodplain) scrub.

- Sensitive wildlife species in the sub-basin include one location for the California gnatcatcher, 13 locations for the cactus wren, and records for the San Diego horned lizard, grasshopper sparrow, rufous-crowned sparrow and yellow-breasted chat.

- Riparian habitat in the sub-basin supports nest sites for the long-eared owl, white-tailed kite, Cooper's hawk, red-tailed hawk, and red-shouldered hawk.

- Sensitive plants in uplands adjacent to the creek include many-stemmed dudleya (forms part of the *major population* in upper Gabino Canyon) and two locations of intermediate mariposa lily, which comprise an *important population* because of their geographic separation from other locations.

- La Paz Canyon provides movement opportunities for wildlife including mountain lion, bob cat, coyote and mule deer among the Talega and Gabino and Blind Canyon subunits and Camp Pendleton

b. Planning Recommendations

1. Protection Recommendations

- Maintain a habitat linkage along La Paz Canyon to convey movement and dispersal by mountain lion, bobcat, coyote and mule deer.

- Maintain contiguity and connectivity of coastal sage scrub to provide dispersal habitat for the cactus wren and other sensitive coastal sage scrub species.

- Maintain riparian habitat supporting nesting raptors.

- Protect alluvial fan scrub and hydrological conditions that support this plant community.

- Protect the locations of many-stemmed dudleya in the upper portion of the sub-basin.

- Protect the two discrete locations of intermediate mariposa lily in the middle portion of the sub-basin.

- Protect the integrity of arroyo toad populations in lower Gabino Creek, as well as downstream populations in Cristianitos and San Mateo creeks, by protecting the generation and transport of coarse sediments to downstream areas.

5.2.7 Talega Canyon Sub-basin

a. Planning Considerations - Existing Conditions and Resources

- Soils in the Talega sub-basin include erodable silts in steep slopes in the eastern portion and erodable clays in the western portion.

- Elevations in the sub-basin range from approximately 180 feet above sea level at the confluence of Talega and Cristianitos creeks to 800 feet in the eastern portion.

- The sub-basin is approximately 5 miles from the Pacific Coast.

- Upland habitats in the Talega Canyon sub-basin include coastal sage scrub, chaparral and grassland, with a mixture of sage scrub and chaparral in the upper portion of the canyon, and grassland and sage scrub in the lower part of the canyon south of the TRW facility.

- Riparian habitat in Talega Creek includes sycamore riparian woodland and coast live oak riparian woodland. Substrate in Talega Creek is rock/cobble dominated with sandbars forming in depositional areas. The riparian habitat consists of dense stands of structurally diverse, mature coast live oak and southern sycamore riparian woodlands. Center portions of the creek support mule fat scrub and open sand bar habitat. The riparian zones are confined by the geology of the valley, but contain high topographic complexity, an abundance of coarse and fine woody debris, leaf litter, and a mosaic of understory plant communities. The creek contains shallow pools that retain water into the late spring and summer.

- Approximately seven California gnatcatchers locations and 22 cactus wren locations are scattered in the sage scrub on the south-facing slopes of the canyon.

- A *major population* of arroyo toad is present in Talega Canyon and was categorized as "abundant" by Bloom in 1998, with an estimated 1,000+ calling toads. This *major population* is assumed to be the largest in the subregion and is in a *key location*. In addition, this population is connected to the downstream arroyo toad populations in lower Cristianitos and San Mateo creeks on Camp Pendleton, as well as the upstream *key location* in lower Cristianitos and lower Gabino creeks.

- The two-striped garter snake has been observed in Talega Canyon.

- Raptors nesting in Talega Canyon include white-tailed kite, long-eared owl, Cooper's hawk, red-shouldered hawk, red-tailed hawk, great horned owl, and barn owl.

- The uplands adjacent to Talega Creek provide foraging and estivation habitat for the arroyo toad.

- Other sensitive upland wildlife species in the sub-basin include rufous-crowned sparrow, grasshopper sparrow, coastal western whiptail, orange-throated whiptail, San Diego horned lizard, northern red-diamond rattlesnake, and San Diego ringneck snake.

- Three small uncounted locations of thread-leaved brodiaea occur in the Talega sub-basin on the mesa east of TRW near the boundary with the Gabino and Blind Canyons subunit and one occurs just southeast of the TRW facilities. Although apparently not a large population, these locations may be considered an *important population* because they potentially contribute to connectivity and genetic exchange among the various nearby locations in the subregion.

- Eight locations of many-stemmed dudleya are known from Talega Canyon east of TRW, but population estimates were not made. An additional location occurs just southeast of the TRW facility. Although population estimates are not available, these locations may be considered *important populations* because they contribute to geographic diversity in the subregion and potentially provide a connection with nearby populations on Camp Pendleton.

- Chaparral beargrass (CNPS List 1B) occurs at five locations on the steep, south-facing slopes in the eastern portion of the sub-basin and one in coastal sage scrub in the north-central part of the sub-basin.

- Talega Canyon is a habitat connection for large- and medium-sized mammals such as mountain lion, mule deer, bobcat, coyote, and gray fox in the San Mateo Watershed.

b. Planning Recommendations

1. Protection Recommendations

- Protect the integrity of arroyo toad populations in Talega Canyon by maintaining current stormwater runoff patterns and hydrologic conditions.

- Provide for comprehensive water quality treatment consistent with protection of arroyo toads in Talega Creek.

- Protect breeding and foraging habitat and movement opportunities within the streamcourse and adjacent alluvial terraces for the arroyo toad. Address potential upland estivation habitat needs in the context of best scientific information regarding the influence of topography, soils and other factors that appear to influence arroyo toad lateral movement and frequency of use in upland areas away from streamcourse habitat areas.

- Protect raptor nesting locations in the sub-basin, with particular attention to nesting of white-tailed kite and long-eared owl within the sub-basin.

- Maintain an east-west habitat linkage for gnatcatcher and cactus wren to protected habitat in the Talega and Forster Ranch Planned Communities.

- Maintain an east-west habitat linkage for large mammals along Talega Creek with sufficient width at confluence with Cristianitos Creek and along south-facing slope.

- Protect the three known locations of thread-leaved brodiaea east the TRW facilities that constitute an *important population*

- Protect eight locations of many-stemmed dudleya east of the TRW facilities that may constitute an *important population*.

5.2.8 Other Planning Area

A small area comprising approximately 290 acres is located in the San Mateo Creek Watershed on RMV land south of the Cristianitos sub-basin, southeast of the Donna O'Neill Conservancy at Rancho Mission Viejo and west of the Lower Gabino and Blind Canyons sub-basin and the Talega sub-basin. This area warrants a discussion because although it is outside the identified sub-basins it has important biological resources and reserve design considerations. The dominant landscape feature of the area is lower Cristianitos Creek south of the confluence with Gabino Creek where it exits RMV property.

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a. Planning Considerations – Existing Conditions and Resources

- Soils in the main canyon primarily sandy and soils on the uplands adjacent to TRW are erodable clays.

- Elevations in the area range from approximately 200 feet above mean sea level in the creek bottom to approximately 300 feet on the mesa east of the creek.

- The area is approximately 4 miles from the Pacific Coast.

- Upland habitats in the area are dominated by annual grassland and small patches of coastal sage scrub and southern cactus scrub. A small patch of native grassland is present on the northeast corner of the area that overlaps with native grasslands in the Gabino and Blind Canyons sub-basin.

- Riparian habitats in lower Cristianitos Creek include southern coast live oak forest and woodland, southern sycamore riparian woodland, southern willow scrub, arroyo willow riparian forest, and mule fat scrub.

- Recent studies have identified substantial invasive plant species in this area.

- The small, scattered patches of coastal sage scrub support only one gnatcatcher location and the site is not part of an *important population*.

- Scattered cactus scrub supports about six cactus wren locations.

- The grasslands include about 16 locations of the grasshopper sparrow.

- Other sensitive upland wildlife species in the area include rufous-crowned sparrow, San Diego desert woodrat, orange-throated whiptail and western whiptail.

- The reach of Cristianitos Creek between the confluence with Gabino Creek and the planning boundary supports an *important population* of the arroyo toad in a *key location*. Toad counts for this reach have ranged from 11 individuals in 1998 to 37 in pre-1997 surveys, and toads have been found in the area in all surveys conducted.

- The uplands adjacent to Cristianitos Creek provide foraging and estivation habitat for the arroyo toad.

- The riparian habitat supports breeding habitat for the least Bell's vireo (5 locations), yellow-breasted chat (11 locations) and yellow warbler (1 location).

- A variety of raptors historically have nested in the riparian habitat, including long-eared owl (1 location), Cooper's hawk (1 location), red-tailed hawk (3 locations), red-shouldered hawk (2 locations), great horned owl (1 locations) and barn owl (1 location).

- The grasslands adjacent to Cristianitos Creek provide foraging habitat for both breeding resident and wintering raptors such as ferruginous hawk and Swainson's hawk.

- The only known sensitive plant from the area is many-stemmed dudleya, with approximately four discrete locations. Two of the locations have population counts of 20 and 33 individuals. These locations are part of the *major population* of dudleya in the Cristianitos and lower Gabino and Blind Canyons sub-basins.

- This area, in conjunction with the Cristianitos sub-basin, probably serves as a primary north-south dispersal area for the California gnatcatcher between large populations in Chiquita Canyon and Camp Pendleton.

- In combination with Talega, Gabino, La Paz, and Cristianitos canyons above the confluence with Gabino Creek, this area provides a habitat connection for the mountain, mule deer, bobcat, coyote and gray fox to adjoining sub-basins and Camp Pendleton.

b. Planning Recommendations

1. Protection Recommendations

- Protect a habitat linkage, consisting of the Donna O'Neill Land Conservancy and an area along the east side of Cristianitos Creek, to provide connectivity for gnatcatchers in the upper portion of the sub-basin with other populations in lower Gabino Creek and Camp Pendleton along lower Cristianitos/San Mateo Creek, and to maintain habitat integrity through connectivity within the Donna O'Neill Land Conservancy at Rancho Mission Viejo.

- Protect the majority of native grasslands in the area.

- Protect the integrity of arroyo toad populations in lower Cristianitos Creek by maintaining current hydrologic conditions.

- Protect breeding and foraging habitat and movement opportunities within the streamcourse and adjacent alluvial terraces for the arroyo toad. Address potential upland estivation habitat needs in the context of best scientific information regarding the influence of topography, soils and other factors that appear to influence arroyo toad lateral movement and frequency of use in upland areas away from streamcourse habitat areas.

- Protect breeding and foraging habitat for the least Bell's vireo, yellow-breasted chat and yellow warbler along lower Cristianitos Creek.

- Protect breeding habitat and to the extent feasible foraging habitat for resident and wintering raptor species.

- Maintain a north-south habitat linkage along Cristianitos Creek between San Juan Creek and lower San Mateo Creek for gnatcatchers and other avian species, as well as large mammals such as mountain lion, bobcat, coyote, and mule deer.

- Maintain an east-west habitat linkage from Gabino Creek to the confluence with Cristianitos Creek for wildlife movement between Gabino Canyon and the Donna O'Neill Conservancy at Rancho Mission Viejo.

2. Management Recommendations

- In conjunction with upstream and adjacent eradication efforts, implement an invasive plant species control program.

5.3 Other Planning Area-Wide Species Considerations

Several other planning species have broad geographic distributions and habitat requirements, and thus are best addressed at the subregional landscape level rather than the sub-basin level. These species include golden eagle, mountain lion and mule deer.

5.3.1 Golden Eagle

a. Planning Considerations – Existing Conditions and Resources

Golden eagles are an uncommon resident in the subregion. They are known to nest in the Cleveland National Forest, and although they are not known to nest on RMV, they occasionally forage in grasslands and agricultural areas throughout much of RMV, but especially in grasslands and agricultural areas in the Chiquita, Gobernadora, upper Gabino, Cristianitos and Talega sub-basins.

b. Planning Recommendations

1. Protection Recommendations

- Protect foraging habitat for the golden eagle to the extent feasible in the Chiquita, Gobernadora, upper Gabino, Cristianitos and Talega sub-basins.

5.3.2 Mountain Lion

a. Planning Considerations – Existing Conditions and Resources

Mountain lions range throughout much of the undeveloped portions of the planning area. The most extensive work on mountain lions in the study area has been conducted by Beier and Barrett (1993) using radiotelemetry to track lion movements. They included virtually the entire planning area as mountain lion habitat for the Santa Ana Mountains population. They also identified important lion use areas in the planning area, including Arroyo Trabuco, General Thomas F. Riley Regional Park and the Donna O'Neill Land Conservancy at Rancho Mission Viejo. The FTC surveys also recorded mountain lions at three camera stations: TRW/Cristianitos, Blind and Gabino canyons, and Sulphur Canyon. While much of the planning area provides habitat for the mountain lion, Gabino, La Paz, and Blind canyons in the San Mateo Watershed and Verdugo Canyon in the San Juan Creek Watershed provide particularly important "live-in" and movement habitat connecting the southern portions of the planning area with the Cleveland National Forest. The western portion of the planning area, including Arroyo Trabuco, Sulphur Canyon, and Chiquita Ridge, provide important movement habitat, but are less suitable as "live-in" habitat because habitat blocks are not as large and adjacent urban development increases the risk of mountain lion mortality from vehicle collisions and depredation.

b. Planning Recommendations

1. Protection Recommendations

- Protect "live-in" habitat within the portion of the San Mateo Watershed in the planning area and Verdugo Canyon in the San Juan Creek Watershed adequate to meet the life history requirements of the mountain lion, comprising a large, unfragmented block of chaparral and coastal sage scrub directly connected to more than 100,000 acres in Caspers Wilderness Park, the Cleveland National Forest, and Camp Pendleton. (Beier and Barrett [1993] describe the Santa Ana Mountain Range as encompassing 800 mi^2 [512,000 acres) of "contiguous wildlands used by cougars." This habitat includes the Santa Margarita Mountains, the Santa Rosa Plateau, the Chino Hills and the San Joaquin Hills.) "Live-in" habitat provides adequate prey (primarily mule deer) and vertical and horizontal cover suitable as resting and bedding sites (e.g., woodlands and riparian areas, rocky areas). The reader should note that the "live-in" habitat within in the San Mateo Watershed portion of the planning area and Verdugo Canyon would only provide about 25-30 percent of an average mountain lion home range in the Santa Ana Mountains (Padley 1989, 1996), and that the home range of any lions using the planning area likely will include Caspers Wilderness Park, Audubon Starr Ranch Sanctuary, Cleveland National Forest, and Camp Pendleton.

- Maintain habitat connections throughout the planning area to provide movement opportunities for the mountain lion. As described above for individual sub-basins, as well as other areas in the planning area, important movement areas for mountain lion include Arroyo Trabuco, the Foothill-Trabuco Specific Plan Area, Chiquita Ridge, Sulphur Canyon, San Juan Creek, Trampas Canyon, Cristianitos Canyon, Verdugo Canyon, Gabino Canyon, La Paz Canyon and Talega Canyon.

2. Management Recommendations

In areas identified as "live-in" habitat or habitat connections, roads that are necessary to serve approved land and water uses located inside or outside the Habitat Reserve shall be designed and sited to accommodate mountain lion movement to the maximum extent feasible. Where roads are necessary, under the approved NCCP/HCP, they will be designed consistent with safety, roadway design criteria that are appropriate for the setting and desired roadway function. Roadway design shall include bridges and/or culverts large enough to accommodate mountain lion movement at key areas and, where appropriate and feasible, may include wildlife over crossings. As appropriate, fencing, grading and plant cover will be provided to serve wildlife crossings consistent with conservation principles and the adaptive management program. Where feasible and safe, lighting along roadways within the Habitat Reserve should be avoided. Where roadway lighting within the Habitat Reserve is necessary for public safety reasons, it should be low-sodium or similar low intensity lighting that is directed away or shielded from the Habitat Reserve.

5.3.3 Mule Deer

a. Planning Considerations – Existing Conditions and Resources

Mule deer are common in the planning area in coastal sage scrub, chaparral, and woodland habitats. A radiotelemetry study of mule deer was conducted by Padley (1992) in what he termed the "Gabino" and "Chiquita" general areas. This study characterized habitats use and movement patterns and concluded that mule deer in the planning area are year-round residents (i.e., they do not migrate) and their home ranges are relatively small. Also, there are no critical resource areas (e.g., meadows or mineral licks). Areas frequently used by deer include most of the major drainages and canyons, including Chiquita Canyon, Blind Canyon, Verdugo Canyon, Gabino Canyon, La Paz Canyon, and Trampas Canyon. Deer also frequent Arroyo Trabuco, Gobernadora Canyon, Bell Canyon, and many other smaller drainages. In addition, mule deer are the main prey of mountain lions and their presence in the planning area is important for maintaining the mountain lion population.

b. Planning Recommendations

1. Protection Recommendations

- Protect “live-in” habitat within the portion of the San Mateo Watershed in the planning area adequate to meet the life history requirements of the mule deer, comprising a large, unfragmented block of chaparral and coastal sage scrub directly connected to Caspers Wilderness Park, the Cleveland National Forest, and Camp Pendleton.

- Protect “live-in” habitat within the San Juan Creek Watershed in the planning area adequate to meet the life history requirements of the mule deer, including Chiquita Ridge, Chiquadora Ridge, the ridgeline separating the Chiquita and Wagon Wheel sub-basins, and the ridgeline separating the Gobernadora and Bell Canyon sub-basins that directly connects to Caspers Wilderness Park and Audubon Starr Ranch Sanctuary.

- Maintain habitat connections throughout the planning area to provide movement opportunities for the mule deer. As described above for individual sub-basins, as well as other areas in the planning area, important movement areas for mule deer include Arroyo Trabuco, the Foothill-Trabuco Specific Plan Area, Chiquita Ridge, Sulphur Canyon, San Juan Creek, Trampas Canyon, Cristianitos Canyon, Verdugo Canyon, Gabino Canyon, La Paz Canyon and Talega Canyon.

2. Management Recommendations

In areas identified as “live-in” habitat or habitat connections, roads that are necessary to serve approved land and water uses located inside or outside the Habitat Reserve shall be designed and sited to accommodate mule deer movement to the maximum extent feasible. Where roads are

necessary, under the approved NCCP/HCP, they will be designed consistent with safety, roadway design criteria that are appropriate for the setting and desired roadway function. Roadway design shall include bridges and/or culverts large enough to accommodate mule deer movement at key areas and, where appropriate and feasible, may include wildlife over crossings. (note: of the large mammal species, mule deer are the most sensitive to bridge and culvert design. Designs that accommodate mule deer are generally suitable for mountain lion, bobcat and coyote.) As appropriate, fencing, grading and plant cover will be provided to serve wildlife crossings consistent with conservation principles and the adaptive management program. Where feasible and safe, lighting along roadways within the Habitat Reserve should be avoided. Where roadway lighting within the Habitat Reserve is necessary for public safety reasons, it should be low-sodium or similar low intensity lighting that is directed away or shielded from the Habitat Reserve.

SECTION 6: PLANNING AREA RESTORATION OVERVIEW

The term "restoration" is used very broadly in this document. It is intended to cover the spectrum of possible restoration activities, from creation of new habitats to enhancement of existing degraded habitats. It is anticipated that restoration actions will be undertaken in accordance with certified/approved restoration plans under the NCCP/HCP and SAMP/MSAA within the NCCP/HCP Habitat Reserve and in areas subject to the aquatic resource management program. As a planning area-wide comprehensive program, this section summarizes restoration recommendations for several sub-basins and explains how these recommendations could contribute to a more effective Habitat Reserve and adaptive management program. Restoration recommendations are considered preliminary and will be subject to refinement and modification during the NCCP/HCP approval and environmental documentation processes. Preliminary restoration areas are illustrated in Figure 6-1.

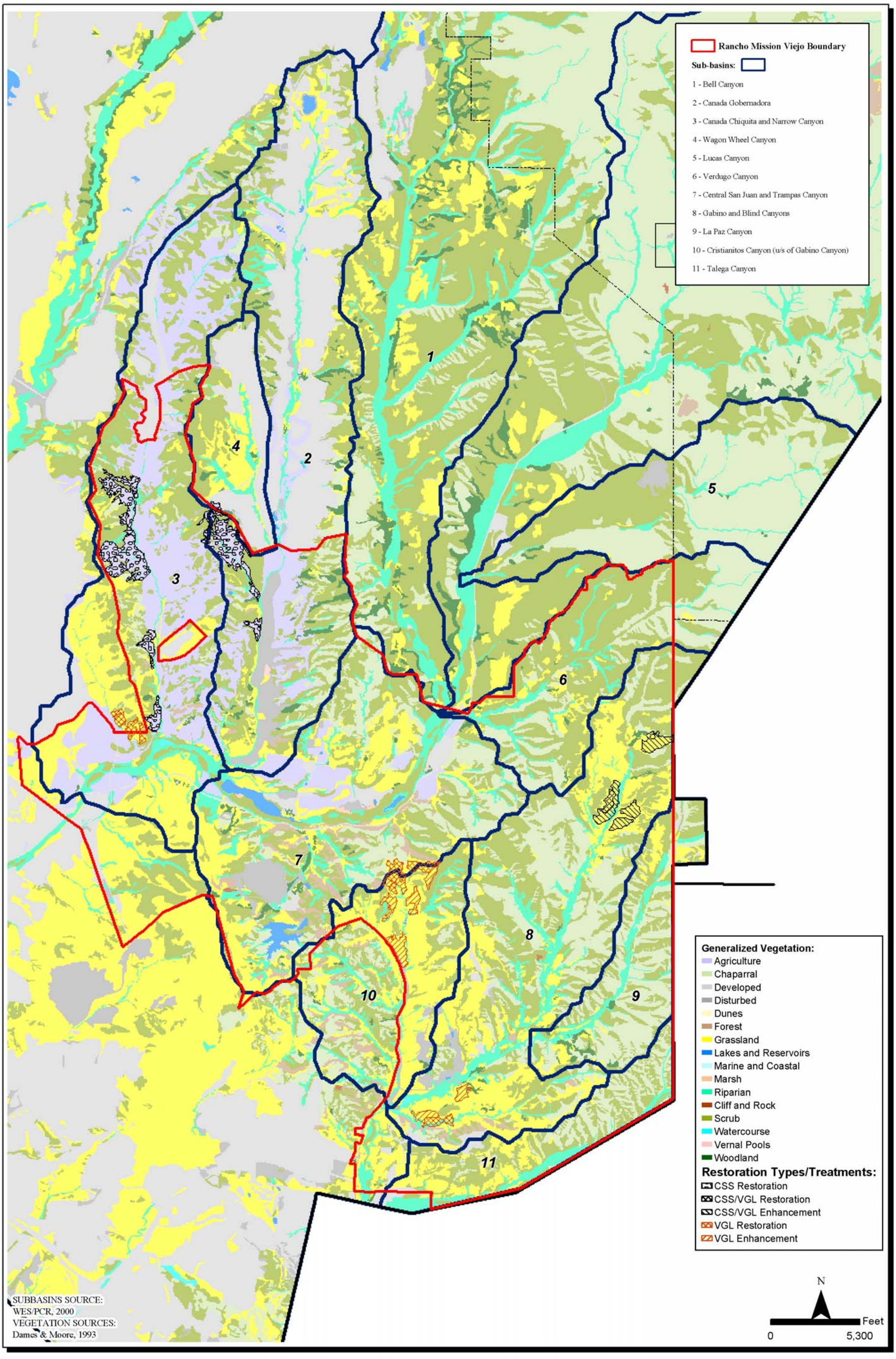
6.1 Restoration of Upland Habitats

6.1.1 Preliminary Designation of Coastal Sage Scrub Restoration Areas

The main goal of the coastal sage scrub (CSS) restoration program is to establish CSS in areas that: 1) probably supported CSS prior to ranching operations; and/or 2) would contribute to the Habitat Reserve by increasing the carrying capacity for the California gnatcatcher and other sage scrub species. With these goals in mind, the following areas have been tentatively identified for CSS restoration. Selection of these areas for restoration/enhancement will require additional field study to determine the likelihood of a successful restoration program, including factors such as soil conditions and presence of exotic species both within the restoration area and surrounding habitat.

- Sulphur Canyon in the Gobernadora sub-basin was identified for restoration/enhancement to provide additional habitat and enhance connectivity between Chiquita Canyon and Wagon Wheel Canyon to the west and Gobernadora and Bell canyons to the east. Sulphur Canyon is currently characterized by CSS on the slopes of the canyon and grazed annual grasses on the valley floor. Opportunities to improve "live-in" habitat and connectivity for California gnatcatchers through enhancement of existing CSS via the removal of grazing will be identified.

- Several side canyons between Chiquita Ridge and Chiquita Creek were identified for restoration/enhancement. Restoration of the two large canyons just northwest and southwest of the "Narrows" would greatly improve the habitat integrity of Chiquita Ridge, which narrows to less than 2,000 feet in width at the top of these side canyons, and provide substantial "live-in" habitat for California gnatcatchers and other species, and improve the integrity of the reserve system.



Draft NCCP/HCP Planning Guidelines

Preliminary Restoration Areas

FIGURE 6-1

6.1.2 Preliminary Designation of Valley Needlegrass Grassland Restoration Areas

Areas identified for potential valley needlegrass grassland (VGL) restoration/enhancement includes areas that 1) currently support annual grasses, but have suitable soils and are adjacent to existing VGL; 2) currently support low quality VGL (i.e., areas with less than 10 percent cover of native grasses); and 3) would contribute to an overall native grasslands ecosystem (i.e., small, isolated patches of native grasslands would not be considered valuable to the overall system). Because establishing a functioning native grassland system is a goal of the restoration program, impacts to native grasslands in a particular sub-basin may be mitigated in another sub-basin to achieve greater value for the overall reserve system. Upper Cristianitos and portions of Blind Canyon mesa are recommended for VGL restoration.

- Upper Cristianitos is recommended for VGL restoration and enhancement to reduce the generation of fine sediments from clayey terrains, promote stormwater infiltration and to enhance the value of upland habitats adjacent to Cristianitos Creek. This area includes areas of annual grassland underlain by clay soils suitable for restoration and low quality VGL suitable for enhancement. These areas also are contiguous with existing medium quality grassland, suggesting a high likelihood of successful restoration/enhancement.

- Portions of Blind Canyon mesa are recommended for grassland restoration. This area has at least one patch of annual grassland suitable for restoration and possibly two patches of low quality VGL suitable for enhancement. These areas are adjacent to existing medium quality VGL, suggesting a high likelihood of successful restoration/enhancement. Additional fieldwork in the area may reveal additional restoration/enhancement opportunities.

6.1.3 Preliminary Designation of Coastal Sage Scrub/Valley Needlegrass Grassland Restoration Areas

The following areas are recommended for CSS/grassland restoration: Upper Gabino and in the Chiquita sub-basin in the area east of the Santa Margarita Water District wastewater treatment plant, the citrus groves west of Chiquita Creek and the disced areas west of the creek to the Chiquita ridgeline.

- Upper Gabino currently generates fine sediment due to extensive gully formation in the headwaters area. A combination of slope stabilization, grazing management and CSS/VGL restoration will reduce sediment generation and promote infiltration of stormwater which will reduce downstream impacts. This area has been identified for a mix of CSS and VGL restoration because some areas mapped as grassland in 1990 have naturally revegetated with sparse CSS. Allowing a mixed community to regenerate may represent a more natural climax situation. This area has at least one area of annual grassland adjacent to the creek suitable for restoration and several patches of low quality VGL suitable for enhancement.

- As discussed above for CSS, restoration of disturbed areas of Chiquita Canyon west of Chiquita Creek will provide additional habitat for upland species occupying Chiquita Ridge, and particularly the gnatcatcher. Restoration of areas previously used for agricultural purposes, including grazing and citrus, will also benefit riparian species by removing uses that may contribute to downstream impacts. Additional field work will be needed to identify the areas best revegetated with CSS alone and CSS/VGL.

6.2 Restoration of Riparian/Wetland Habitats

6.2.1 Preliminary Designation of Riparian/Wetland Restoration Areas

The following areas are recommended for riparian/wetland restoration: Gobernadora Creek and upper Gabino Creek.

- Gobernadora Creek is recommended for riparian/wetland restoration to address the historic meander conditions and excessive sediment input resulting from upstream land uses. Restoration may include the construction of a detention/water quality basin below Coto de Caza.

- Creation of wetland breeding habitat for the tricolored blackbird should be considered a priority in the Gobernadora area because breeding populations have regularly occurred in the ponds in southern Coto de Caza. Northward extension of riparian habitats from GERA also would provide additional breeding habitats for least Bell's vireo, southwestern willow flycatcher, yellow-breasted chat, yellow warbler, raptors and other wetland species such as two-striped garter snake.

- Upper Gabino Creek currently generates fine sediment due to extensive gully formation in the headwaters area. To address this excessive sediment generation and reduce downstream impacts, both upland habitat restoration (described above) and wetland/riparian restoration is recommended. Depending on the type of wetland restoration in upper Gabino Canyon, several wildlife species could benefit, including two-striped garter snake, southwestern pond turtle, tricolored blackbird, and the riparian birds listed above.

6.2.2 Preliminary Designation of Small-scale Creek Stabilization Areas

Several smaller scale creek stabilizations are recommended to address locally induced headcuts in Chiquita Creek and upper Cristianitos.

- Locally induced headcuts (as contrasted with valley deepening reflecting longer-term geologic processes) are present in Chiquita Creek and Upper Cristianitos. Headcuts in Chiquita Creek are caused by the placement of road crossings or other anthropogenic causes. Headcuts in Cristianitos may have a similar origin but may also be influenced by long-term

geologic processes. Further investigations of the causes of the Cristianitos headcuts will be necessary before identifying a specific restoration approach.

APPENDIX A

Principles of Reserve Design, Species Conservation and Adaptive Management

For the Proposed Southern Orange County NCCP

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1998

Introduction

The Orange County Southern NCCP Subregion Science Advisors (science advisors) were proposed as a means to assist the county in bringing scientific information and experience to bear on the conservation planning process for the southern subregion. The science advisors are independent from the county. The consulting team and county are not bound by the input of the advisors, but it is a generally held consensus among participating interests that sound scientific advice is an important part of creating a strong plan for the subregion.

The science advisors were tasked with developing three products: 1) principles for reserve design; 2) principles for conservation of species and habitats; and 3) principles and goals for an adaptive management program. This document presents the results of theses tasks.

The ultimate reserve design and likelihood of conserving certain species can be improved, and the probability of success over time increased, by the application of additional information from a research agenda targeted to provide key data to planning. These data include species/habitat relationships, autecological studies, presence/absence of rare species and narrow endemic species, natural disturbance patterns, life history characteristics, and other information. Much of this need is detailed in the original NCCP research agenda proposed by the Statewide Scientific Review Panel in 1993.

The Southern Orange County science advisors believe that existing data can lead to a supportable reserve design in the subregion for the species considered. This initial design could be further refined and improved through application of additional data, but the science advisors believe that the time and expense of such surveys relative to their likely effect or improvement on ultimate reserve design makes this exercise impractical. Some research needs to further increase the effectiveness of the conservation plan during the implementation phase, however, are identified in the Adaptive Management section of this report.

The language and terms used by the science advisors to describe the principles for species conservation, reserve design and adaptive management are not intended to correspond to legal definitions (e.g. “conserve,” or “critical”). The use of such words or phrases, unless specifically stated otherwise, is descriptive in nature and not intended to be legally explicit.

The Science Advisors

The goal of assembling a group of science advisors specific to the Southern Orange NCCP subregion was to bring individuals with relevant expertise and local experience to address issues unique to the subregion and provide advice useful to the consulting team and the county in developing alternative conservation plans. Some overlap exists with the state-authorized Science Advisors, but subregional advisors have a broader range of skills, including land management and ecological restoration. The science advisor process for the subregion was facilitated by The Nature Conservancy. The Conservancy recommended the individual advisors after broad and extensive consultation with the NCCP working group. Several of the advisors were compensated for their consultation by the State of California Department of Fish and Game using funds previously identified and intended for procuring scientific advice for the NCCP program.

There are other scientists, both locally-based and elsewhere, who are qualified to provide the advice and input needed to the subregional planning process. These individuals were not overlooked in creating the science advisors, rather the intent was to assemble a group with broad expertise and local experience that could perform needed tasks within the schedule necessary for the overall plan. The makeup of the science advisors did not preclude other individuals being called upon as necessary to address the tasks or provide review. This was done on several occasions, particularly with regard to expertise on plant and invertebrate species.

Assumptions

Descriptions of the specific tasks of the science advisors are summarized below at the beginning of the presentation of results for each task. It is important, however, to briefly discuss the general assumptions that the science advisors have operated under while addressing their work. These assumptions arose out of the direction the advisors received from the working group and are reviewed here.

1. *Role of advisors in reserve design decisions*: The final reserve design and boundaries will be recommended to the county by the consulting team based on an analysis of alternatives. The role of the science advisors and the principles they develop is to provide the best available information to the consulting team and the county. The science advisors will not be called upon to approve the final reserve design.

2. *Information used in science advisors work*: The principles for reserve design and conservation of species detailed in this report were derived by applying available information from local research, peer reviewed literature, and the experience of the science advisors and other available experts. This product represents a synthesis of scientific information about the targeted landscape, habitats and species in the Southern subregion. Except where noted, the advisors applied all the information they were provided. The advisors believe that the resulting principles will result in a reserve design and covered species list that is supported by current knowledge.

3. *Planning constraints*: Existing development, past disturbance, and current development agreements place limits on overall reserve design options within the subregion. These constraints may not be adjustable to any significant degree.

4. *Species and habitat assumptions*: The overall goal of the NCCP planning process is to protect the maximum number of species and range of habitats on the lists provided, modified by a roughly hierarchical analysis of importance. Legally protected species and rare habitats are highest priority, followed by subregional endemic species and eco-regional endemic species. Species with broader distributions follow these in importance.

5. *Ecosystem and process assumptions*: Preserves will be managed for long-term persistence of sensitive biological resources and habitat integrity, however they may be open to the public for certain types of recreation and selectively grazed. Fire and flood management practices will be necessary within the preserves along the urban interface. Also, the advisors note their strong preference for conservation through maintenance of extant habitats and linkages where possible, instead of using restoration and re-

vegetation. While in some cases this may be necessary to achieve overall habitat value goals, these are not considered biologically functional equivalents.

Results of Assigned Tasks

The working group and the County of Orange assigned the science advisors three tasks: 1) principles for reserve design; 2) principles for conservation of species and habitats; and 3) principles and goals for an adaptive management program. The following sections detail the result of those tasks, and together they form the advice of the science advisors for developing the NCCP for the subregion with respect to these issues.

Task I. Translation of NCCP Conservation Guidelines to Subregional Reserve Design Principles

Conservation guidelines developed by the state Scientific Review Panel (SRP) for NCCP in November, 1993, identified the biological foundation for planning for the entire 6,000 square mile NCCP region in Southern California. These guidelines established the scientific foundation for planning and articulated an interim conservation strategy, a research agenda, and premises on management and restoration of reserves.

The part of the SRP guidelines most relevant to the task of designing reserves was identification of seven basic tenets of reserve design applicable to NCCP. These general rules (listed below) are truisms of reserve design that form the basic scientific understanding of creating protected areas. It was determined, however, that additional specificity was useful regarding principles of reserve design for the southern subregion beyond that provided in the guidelines. The intent of the original SRP was that the tenets would be interpreted during subregional planning into geographically specific principles appropriate for that subregion, and this task is a fulfillment of that objective.

This report constitutes partial fulfillment of the SRP objective of translating the general NCCP reserve design tenets into explicit reserve design principles for the southern Orange County subregion. The intent of the science advisors is that the following subregional principles be general enough to allow flexibility in creating plan alternatives (in other words not parcel-specific), but precise enough that they capture the unique needs of the subregion. The principles constitute a set of "parameters of engagement" against which reserve design alternatives can be evaluated. The original seven tenets serve as categories under which the subregional principles can be grouped. It is important to note that the subregional science advisors modified the original seven tenets for the purposes of planning for the southern subregion. The subregional advisors combined *"keep reserve areas close"* and *"link reserves with corridors"* into one category, and added a new tenet: *"maintain ecosystem processes."*

In addition, to the above considerations, the science advisors recognize that it may be impractical or unrealistic to expect that every design principle will be completely fulfilled throughout the subregion. They also recognize that fulfillment of some principles may conflict with others. It is for this reason that the principles have been stated as "should" in most cases, rather than as absolutes. The principles of reserve design are specifically intended to form the scientific foundation for planning, but it is clear that the final reserve design will reflect a balance of a

number of important interests of which biological conservation is but one. By the same token, the advisors do not believe that science should be treated as a competitive interest in planning negotiations, but instead should be a source of objectivity to inform the reserve design process.

Tenet 1. Conserve target species throughout the planning area

Species that are well distributed across their native ranges are less susceptible to extinction than are species confined to small portions of their ranges.

Reserve Design Principles:

- The three "official" target species (*Polioptila californica californica, Campylorhynchus brunneicapillus and Cnemidophorus hyperthyrus beldingi*) have not proven broad enough in their habitat requirements to serve as surrogate species for a multiple-habitat reserve of the type desired by planners in southern Orange County. Additional species may be necessary as indicators of other habitats (see #5 below).

- Reserve design alternatives should conserve species throughout the planning area.

- Reserves should carefully consider life history characteristics of species (breeding habitat, dispersal, foraging habitat, genetics, source/sink dynamics, the role of unoccupied habitat), particularly for those that are legally protected, endemic, or known to be declining.

- Reserves should maintain the potential for re-establishment and/or enhancement of sensitive species (such as tricolored blackbird, least Bell's vireo, willow flycatcher, red-legged frog, yellow-billed cuckoo, southern steelhead, quino checkerspot, common garter snake, black rail, etc.)

- Potential reserve sites should be prioritized based on the presence or potential presence of species or other ecological phenomena in the following five categories:

    1. *Legally protected species*: California gnatcatcher, least Bell's vireo, southwestern willow flycatcher, red-legged frog, arroyo southwestern toad, pacific pocket mouse, southern steelhead

    2. *Rare plant or habitat associations*: native grasslands, vernal pools, cliffs

    3. *Upper trophic level or generalist species*: golden eagle, red-tailed hawk, great horned owl, barn owl, mountain lion, bobcat, coyote, badger

    4. *Locally rare species*: long-eared owl, glossy snake, patch-nosed snake, long-nosed snake, lyre snake, blind snake, legless lizard, banded gecko, Gilbert's skink,
    5. *Species indicative of the quality of select habitat-types (NOTE: These are not "umbrella" species, nor necessarily sensitive species, but rather a collection of species with an affinity for each habitat-type. These species are highly indicative*

of the habitats which they occupy, and can be good indicators of both the quality of habitat and the presence of other species dependent upon that habitat-type):

a) Riparian - red-shouldered hawk, Cooper's hawk, sora, common yellowthroat, two-striped garter snake, red racer, arroyo toad, California tree frog, pacific pond turtle, arroyo chub, threespine stickleback, several bats

b) Coastal sage scrub - California gnatcatcher, cactus wren, wrentit, greater roadrunner, pacific kangaroo rat, California pocket mouse, red diamond rattlesnake, orange throated whiptail, spotted night snake, San Diego horned lizard

c) Oak woodland - Cooper's hawk, long-eared owl, western screech owl, acorn woodpecker, Nuttall's woodpecker, ash-throated flycatcher, bobcat, brush mouse, California slender salamander, bats

d) Grassland - white-tailed kite, northern harrier, burrowing owl, grasshopper sparrow, horned lark, savannah sparrow, lark sparrow, western meadowlark, loggerhead shrike, badger, western skink, ring-necked snake, western spadefoot toad, bats

e) Chaparral - wrentit, bushtit, spotted towhee, California thrasher, black-chinned sparrow, pacific kangaroo rat, California pocket mouse, rosy boa, western whiptail, red diamond rattlesnake, lyre snake

f) Pond - great blue heron, black crowned night heron, snowy egret, pied-billed grebe, tricolored blackbird, red-winged blackbird, sora, common yellowthroat, pacific pond turtle, pacific chorus frog, western toad, bats

Tenet 2. Larger Reserves are Better

Large blocks of habitat containing large populations of species indicative of habitat quality are superior to small blocks of habitat containing small populations.

Reserve Design Principles:

The science advisors believe this design principle needs no elaboration for the southern Orange County subregional planning area beyond that provided in the original SRP conservation guidelines. The tenet mandates that, **all else being equal,** reserve design options that include greater areal extent are superior. When comparative circumstances are not otherwise equal, habitat diversity, the presence of special landscape features, and concentrations of species of concern will often offset a solely area-driven reserve design selection process. It is in the alternative analysis where these variables are weighed, with appropriate weight given to habitat block size.

Tenet 3. Reserves Should be Diverse

Blocks of habitat for reserves should contain a diverse representation of physical and environmental conditions.

Reserve Design Principles:

- Reserves should capture the environmental gradient, both within and among habitat-types. This includes the elevation gradient, the coast/inland gradient, and variability among soils, vegetation and habitat-types. This should, among other things, increase the probability of including unsurveyed or unknown species in the reserves.

- Several important grassland areas occur within the subregion. They are valuable for a variety of vertebrate species of concern, including the badger, burrowing owl, spadefoot toad, and horned lark. Also, the ecotone between coastal sage scrub and grassland is important for California gnatcatchers. Important grassland areas are: Gobernadora, Chiquita, Upper Gabino, Cristianitos, and areas Northeast of San Clemente and San Juan Capistrano.

- Several key riparian systems occur within the subregion, including along San Juan Creek, Trabuco Creek, and the San Mateo Creek drainage (Gabino and Cristianitos Creeks). Maintaining the integrity of these systems is important for a wide variety of species, including least Bell's vireo, yellow warbler, yellow breasted chat, willow flycatcher, arroyo toad, California glossy snake, silvery legless lizard, southwestern pond turtle, arroyo chub, and threespine stickleback.

- Habitat mosaics on the side of the subregion nearest the coast are important for a number of reptile and amphibian species of concern in the subregion and have historically incurred more losses to conversion than inland portions. They can contain rarer natural subcommunities and higher densities of some species (red diamond rattlesnake, spadefoot toad, San Diego ringneck snake, orange-throated whiptail, coronado skink).

- The reservoir on the north side of Ortega highway along San Juan Creek is an important foraging, nesting and habitat area for several bird species (such as black skimmer, California gull, great blue heron, double-crested cormorant, elegant tern, white pelican, arroyo toad and pond turtle). Maintenance of this reservoir--including periodic silt, sand and gravel removal--is an important part of maintaining these species in the subregion.

- Several canyons are important for nesting raptors, including Gabino, La Paz, Cristianitos and Talega Canyons.

Tenet 4. Keep Reserves Contiguous

Habitat that occurs in less fragmented, contiguous blocks is preferable to habitat that is fragmented or isolated by urban lands.

Reserve Design Principles:

- Reserve design alternatives should seek, in order of priority:

    1. Continuity within habitat (minimize additional fragmentation).
    2. Connectedness (increase existing habitat blocks).
    3. Proximity (minimize distance between habitat blocks).

- The reserve design should strive to maintain the contiguity of large intact habitat blocks and not fragment them internally (e.g. the southeast section of the planning area).

- Reserve design should attempt to minimize physical barriers and visual barriers between reserves, particularly those reserves that are close together. Different groups of species (rodents, birds, large mammals, reptiles) are affected by different barriers and distances. For example, gnatcatcher populations in fragmented habitat blocks rely on visual observation to identify other potential habitat blocks for dispersal. If nearby habitat (less than 0.5 mile) is barred from sight by obstructions, those blocks are effectively separated permanently from one another. Similarly, roads, even two lane asphalt, represent permanent barriers to small mammals and many herpetofauna. These issues should be considered when assessing potential connectivity of reserve alternatives.

- Development around reserves should be directed to existing disturbed areas everywhere possible and away from native communities.

- Reserve selection should favor increasing permanent open space and de facto permanent natural areas, or reserves should be in close proximity to those areas. They include:

    - Rancho Mission Viejo Conservancy
    - Caspers Park
    - O'Neill Park
    - Open Space in Upper Trabuco Creek
    - Wagon Wheel Park
    - Camp Pendleton
    - Cleveland National Forest

Tenet 5. Maintain and Create Landscape Linkages Between Reserves

Blocks of habitat that are close to one another serve species of concern better than blocks of habitat that are situated far apart. Interconnected blocks are better than isolated blocks. Landscape linkages function better when habitat blocks and vegetation within them are natural and resemble habitat and vegetation preferred by key species of concern.

Reserve Design Principles:

- Maintaining the integrity of riparian systems (including major stream courses and their tributaries) is very important for both vertebrates and invertebrates, in:

- San Mateo Drainage (Cristianitos and Gabino creeks)
- San Juan Creek
- Trabuco Creek (downstream of existing open space)
- Gobernadora Creek

- Linkages should follow landscape features and respond to patterns of dispersal exhibited by species considered in reserve design.

- Only open space corridors that are native vegetation serve as truly effective landscape linkages.

- Reserve design should not impose artificial linkages on the landscape at the expense of natural linkages.

- Ridgetop connectivity between Gobernadora and Bell Canyons is an important landscape linkage.

- Landscape linkages should be designed to serve the widest array of species by providing characteristics required for dispersal by the most wide-ranging organisms (mountain lion, bobcat, coyote, red diamond rattlesnake).

Tenet 6. Protect Reserves from Encroachment and Invasion of Non-native Species

Blocks of habitat that are roadless or otherwise serve to minimize human disturbance conserve species better than do accessible habitat blocks

Reserve Design Principles:

- Reserve design should designate a fuel management zone outside the reserve.

- Where possible, areas of reduced human activity and development (recreational parks, parking lots, etc.) are preferable adjacent to reserves.

- Landscape linkages are also vulnerable to edge effects and disturbances. Wide linkages are preferable, so they may contain "interior" habitat.

- Both reserve design configuration and the engineering of impacts in the adjacent areas should minimize the effect of detrimental habitat interfaces (high-speed roads, high density housing) on species most sensitive, particularly species with large home ranges (such as mountain lion or bobcat), or lesser vagility (such as red diamond rattlesnake or rosy boa).

- Reserve design, as well as activities authorized immediately adjacent to reserves, should strive to minimize artificial drainage and downslope movement of materials into conservation areas.

- Reserve design should control and manage human entry into conservation areas.

- Activities within the reserves should be limited to those with least impact on ecological communities and species as well as be restrictive initially and relaxed as appropriate based on impacts. Controls may include limiting visitor numbers, allowing only certain types of activities, and other seasonal constraints. They also may include control of illegal dumping and high-impact recreation, and limiting unauthorized collection of specimens and vermin control.

Tenet 7. Maintain Ecosystem Processes and Structures

Reserves that are designed to maintain ecosystem processes and structures are easier to manage and have a much higher likelihood of sustaining biotic diversity over time than reserves that fragment and disrupt ecosystem processes.

Reserve Design Principles:

- The size, boundaries and shape of reserves should be selected to allow maximum scope for fire management, whether passive ("let it burn") or active in the form of controlled management or experimental fires.

- The reserve system should protect intact hydrologic and erosional processes, including both normal function and extreme events (flooding, earthflow). Reserve design should protect to the maximum extent possible the hydrology and erosion regimes of riparian systems, especially in Cristianitos, San Juan and Trabuco drainages.

- Reserves should minimize the possibility of arson or accidental fires starting or entering the reserves, by including among other things, consideration of potential ignition sources.

Task II. Principles for Conservation of Species and Habitats

The second task of the science advisors in the Southern NCCP subregion is to identify principles for conserving species and habitats under the plan. One end result of the NCCP planning process is generally a permit approving incidental take for an explicit list of species. The process of assembling this species list involves, in part, an evaluation of the extent to which an individual species is effectively conserved by the plan. The wildlife agencies are exclusively responsible for this coverage determination. The science advisors will not be involved in the legal and regulatory process of determining which species receive permit coverage and which do not. The product of this task, instead, is to provide information and objective criteria that may assist the working group and agencies in their analysis. It takes the form of an objective, scientifically-sound set of principles that may serve as a planning hierarchy for conservation decisions (see below).

The consulting team, the Department of Fish and Game and the U.S. Fish and Wildlife Service provided the science advisors with a list of species to be considered for conservation in the Southern subregion. The advisors worked from the list of species that was provided, recognizing that there are other species, such as wide-ranging animals and some rare plants, that are not included on the list. To develop the planning hierarchy and conservation analysis, three groups of

species have been identified from that list. The groups were created based on criteria for each species that should be satisfied to assure their conservation. Species have been grouped based on their life history characteristics, degree of rarity or endemism, regional and global context, response to management, extant population size and trend, genetics, and other variables as necessary. The science advisors have used the criteria within each grouping to substantiate inclusion of a specific species in that group. For the species in the third planning group, the advisors have included a list of the known actions beyond reserve design necessary to achieve conservation of those species in the subregion. The planning groups, their associated criteria for conservation, and the species that fit them (from the species lists provided) are listed below.

Local survey data are incomplete for many taxa, and for plants in particular. Rare plants can present problems for conservation because they are often in patchy and highly localized distributions. Contributing botanists recommend surveying for nearly all the plant species during implementation, particularly in the southeast portion of the subregion, since it is the least studied. Current data and knowledge of rare plant distributions indicates that the Canada Chiquita-Canada Gobernadora-Christianitos axis is likely the most important rare plant area within the southern subregion.

It is fundamental to note that the species have been grouped for conservation based on the assumption that the overall reserve design will adhere as closely as possible to the principles recommended in Task I. The criteria for conservation and the assignment of species to groups will change if the reserve design principles in Task I are not observed. Similarly, some species can be best conserved by a combination of the reserve design principles and by management activities to be developed in Task III. The three sets of principles work together to enable a strong conservation program for the subregion.

Group 1: Minimal Conservation Action Needed

Species whose conservation is affected minimally by the outcome of the planning process.

***Criteria*:** Very limited impact of any alternative plan on species; or
Not found or insignificant in planning area; or
Very high population numbers in subregion

***Species*:**

Birds

Allen's hummingbird	*Selasphorus sasin*
American bittern	*Botaurus lentiginosus*
bald eagle	*Haliaeetus leucocephalus*
bank swallow	*Riparia riparia*
Belding's savannah sparrow	*Passerculus s. beldingi*
black rail	*Laterallus jamaicensis*
black swift	*Cypseloides niger*
black tern	*Chlidonias niger*
Brewer's sparrow	*Spizella breweri*
brown pelican	*Pelecanus occidentalis*

canvasback	*Aythya valisineria*
clapper rail	*Rallus longirostris*
common loon	*Gavia immer*
Costa's hummingbird	*Calypte costae*
gull-billed tern	*Sterna nilotica*
hairy woodpecker	*Picoides villosus*
harlequin duck	*Histrionicus histrionicus*
hepatic tanager	*Piranga flava*
hermit warbler	*Dendroica occidentalis*
horned grebe	*Podiceps auritus*
least bittern	*Ixobrychus exilis*
least tern	*Sterna antillarum*
Lewis' woodpecker	*Melanerpes lewis*
long-billed curlew	*Numenius americanus*
mountain plover	*Charadrius montanus*
olive-sided flycatcher	*Contopus borealis*
osprey	*Pandion haliaetus*
peregrine falcon	*Falco peregrinus*
prairie falcon	*Falco mexicanus*
purple martin	*Progne subis*
reddish egret	*Egretta rufescens*
rufous hummingbird	*Selasphorus rufus*
savannah sparrow	*Passerculus s. rostratus*
snowy plover	*Charadrius alexandrinus*
spotted owl	*Strix occidentalis*
summer tanager	*Piranga rubra*
Vaux's swift	*Chaetura vauxi*
Virginia's warbler	*Vermivora virginiae*
western grebe	*Aechmophorus occidentalis*
white-faced ibis	*Plegadis chihi*
yellow rail	*Coturnicops noveboracensis*

Reptiles

southern sagebrush lizard	*Sceloporus graciosus vandenburgianus*

Mammals

San Diego desert woodrat	*Neotoma lepida intermedia*
Stephens' kangaroo rat	*Dipodomys stephensi*

Group 2: Best Conserved at Habitat/Landscape Level

Species conserved most effectively by protection activities at the habitat or landscape scale. These species are best conserved by following the reserve design principles identified in Task I and the management goals and principles to be identified in Task 3. Their conservation can be relatively accurately inferred from a well-planned and managed network of reserves in a functioning landscape.

***Criteria*:** Widespread within subregion; or
Relatively robust overall species population; or
May or may not be common outside subregion; or
Life history characteristics respond to habitat scale conservation; or
Detailed surveys or inventories not crucial in order to conserve; or
Known or suspected to respond well to habitat management; or
Locally genetically indistinct; or
No individual action needed other than habitat protection and mgmt

***Species*:**

Birds

Bell's sage sparrow	*Amphispiza belli belli*
barn owl	*Tyto alba*
Bewick's wren	*Thryomanes bewickii*
black skimmer	*Rynchops niger*
cactus wren	*Campylorhynchus brunneicapillus*
California gnatcatcher	*Polioptila californica*
California gull	*Larus californicus*
California thrasher	*Toxostoma redivivum*
Cooper's hawk	*Accipiter cooperii*
double-crested cormorant	*Phalacrocorax auritus*
elegant tern	*Sterna elegans*
golden eagle	*Aquila chrysaetos*
grasshopper sparrow	*Ammodramus savannarum*
horned lark	*Eremophila alpestris actia*
lark sparrow	*Chondestes grammacus*
Lawrence's goldfinch	*Carduelis lawrencei*
loggerhead shrike	*Lanius ludovicianus*
merlin	*Falco columbarius*
northern harrier	*Circus cyaneus*
Pacific-slope flycatcher	*Empidonax difficilis*
red-breasted sapsucker	*Sphyrapicus ruber*
red-shouldered hawk	*Buteo lineatus*
rufous-crowned sparrow	*Aimophila ruficeps canescens*
sharp-shinned hawk	*Accipiter striatus*
short-eared owl	*Asio flammeus*
Swainson's hawk	*Buteo swainsoni*
white pelican	*Pelicanus erythrorhynchos*

Amphibians

coast range newt	*Taricha torosa*

Reptiles

coast patch-nosed snake	*Salvadora hexalepis virgultea*
coastal rosy boa	*Lichanura trivirgata roseofusca*
coastal western whiptail	*Cnemidophorus tigris multisc*.
Coronado skink	*Eumeces skiltonianus interpar*.
orange-throated whiptail	*Cnemidophorus hyperthyrus*
San Diego horned lizard	*Phrynosoma coronatum blain*.
San Diego mountain kingsnake	*Lampropeltis zonata pulchra*
San Diego ringneck snake	*Diadophis punctatus similis*

Mammals

California leaf-nosed bat	*Macrotus californicus*
dulzura California pocket mouse	*Chaetodipus californicus femoralis.*
long-legged myotis	*Myotis volans*
mule deer	*Odocoileus hemionus*
pallid bat	*Antrozous pallidus*
San Diego pocket mouse	*Chaetodipus fallax fallax*
spotted bat	*Euderma maculatum*
Townsend's big eared bat	*Plecotus townsendii*
western mastiff bat	*Eumops perotis*

Fish

tidewater goby[1]	*Eucyclogobius newberryi*

Plants

Catalina mariposa lily	*Calochortus catalinae*
Coulter's matilija poppy	*Romneya coulteri*
intermediate mariposa lily	*Calochortus weedii var. Intermedius*
Palmer's grapplinghook	*Harpagonella palmeri*
summer holly	*Comarostaphylos diversifolia diversifolia*
western dichondra	*Dichondra occidentalis*
curving tarweed	*Holocarpha virgata ssp. Elongata*
rayless ragweed	*Senecio aphanactis*

Group 3: Best conserved at species-specific level

Organisms requiring species-level conservation action (including protection of individuals) in order to ensure their conservation, either within the subregion or as a species, are included in Group 3. The species in this group require one or more of three types of conservation action: 1) fine-tuning of reserve design or specific management activities; 2) reintroduction and/or

[1] This species is not known to occur in the planning area, but it is found in the lower San Mateo drainage immediately adjacent to the Southern subregion. The reserve design and activities conducted in the planning area may affect the species downstream.

significant enhancement; or 3) additional data and research are necessary to determine basic needs. Species are identified below with a superscript [1,2 or 3] corresponding to the appropriate type of action needed above. Where possible, species-specific conservation principles have been developed and are provided. In addition, surveys are recommended for all the species in this group during implementation to monitor and fine tune conservation requirements.

***Criteria*:** Known or predicted extremely low population; or
Narrowly endemic within subregion; or
Highly specialized life history requirements; or
Subregion crucial to survival of entire species; or
Known or suspected poor response to management; or
Highly sensitive to small changes in landscape or habitat; or
Dependent on intensive conservation activities; or
Widespread but extremely uncommon

***Species*:**

Birds

least Bell's vireo[1]	*Vireo bellii*
yellow warbler[1]	*Dendroica petechia*
yellow-billed cuckoo[1,2]	*Coccyzus americanus*
yellow-breasted chat[1]	*Icteria virens*
willow flycatcher[1]	*Empidonax traillii*

- Reserve design should conserve riparian habitat along key drainages and tributaries

- Management and enhancement of riparian systems will improve opportunities for these species during implementation

burrowing owl[1]	*Speotyto cunicularia*
ferruginous hawk[1]	*Buteo regalis*

- Reserve design should conserve key grasslands to the extent possible

- Documenting winter distribution and habitat needs is important

long-eared owl[1]	*Asio otus*
white-tailed kite[1]	*Elanus leucurus*

- For conserved nesting sites, undisturbed habitat within 0.5 miles is important (this may be fine-tuned based on local habitat context and topography)

- Basic life history research and monitoring should be included in plan implementation protocol

tricolored Blackbird[1]	*Agelatus tricolor*

- Reserve design should establish a minimum of 100yd buffer around colonies to be conserved

- Permanent ponds with cattails are key breeding and foraging areas

Amphibians

arroyo southwestern toad[1] *Bufo microscaphus calif.*

- Reserve should protect the integrity of important riparian systems and watercourses

- Exotic fish, frogs and Argentine ants should be strongly controlled

- For conserved breeding sites, uplands up to 0.5 miles from associated streams are important

- Light pollution from highways and developments should be minimized

- Surveys should be conducted during implementation to fine tune management

California red-legged frog[2] *Rana aurora draytoni*

- Surveys should be conducted to establish presence/absence in subregion before attempting reintroduction

- Potential habitat should be restored or enhanced

- Exotic predators (bullfrog, sunfish) should be controlled or eliminated

- Water quality and riparian zones should be protected in key drainages

western spadefoot toad[1] *Scaphiopus hammondii*

- Important grassland areas should be conserved or alternatives identified
- Possibly limited by lack of breeding pools in uplands

Reptiles

California glossy snake[1] *Arizona elegans occidentalis*

- Riparian sandy deposits along key drainages should be conserved and sand mining minimized; this is one of 3 places in Southern California where this subspecies has been recorded

- Argentine ants and light pollution from highways should be controlled and minimized

northern red diamond rattlesnake[1] *Crotalus ruber ruber*

- Road kill is suspected to be highest mortality factor; all sources of road kill should be minimized
- Western sections of planning area have highest population density and should be conserved if possible
- Fragmentation of intact habitat blocks should be limited

San Diego banded gecko[3] *Coleonyx variegatus abbotti*

- Expected to occur in very low densities; surveys and monitoring (especially across elevational gradient) needed to establish preferred habitats and conservation needs

silvery legless lizard[1] *Anniella pulchra pulchra*

- One of only two species in Southern California representing an endemic family
- Sandy deposits in San Juan Creek, including downstream reaches, may be important
- Argentine ants should be controlled

southwestern pond turtle[1] *Clemmys marmorata pallida*

- San Juan Creek is an important drainage for this species
- Migrate overland to nest; uplands associated with ponds important
- Road kill and collection by humans should be minimized

two-striped garter snake[1] *Thamnophis hammondii*

- Riparian areas and adjacent uplands to distance of 0.5 miles should be conserved where possible
- Collection of specimens should be minimized

Mammals

Pacific pocket mouse[1,3] *Perognathus longimembris pacificus*

- Encroachment from adjacent development should be minimized, especially housecats
- Suggest additional surveys in suitable habitat
- Closest known population near San Mateo estuary (outside subregion)

San Diego black-tailed jackrabbit[2] *Lepus californicus bennettii*

- Suitable habitat remains in subregion and should be restored/enhanced
- Surveys should be conducted to establish presence/absence before attempting reintroduction
- Human encroachment on reserves should be minimized

southern grasshopper mouse[3] *Onychomys torridus ramona*

- No confirmed presence in subregion, although within historic range
- Surveys necessary to establish presence/absence and management needs

Fish

arroyo chub[1] *Gila orcutti*

- Trabuco and San Juan creek drainages are important to the species
- Exotic fish (e.g. *Gambusia*) should be controlled
- Hydrologic processes and water quality in key areas should be protected and restored

southern steelhead[2] *Oncorhynchus mykiss*

- Conservation plan should coordinate with recovery plan for the species
- Natural hydrology and erosional processes in San Mateo watershed should be maintained to provide restoration opportunities
- San Juan Creek drainage and tributaries are important for restoration

threespine stickleback[1] *Gasterosteus aculeatus ssp.*

- This subspecies is endemic to the San Juan/Trabuco drainage; water quality and quantity in the drainage should be maintained
- Exotic and invasive fishes and frogs should be controlled

Plants

Blochmann's dudleya[1] *Dudleya blochmaniae*

- Coastal bluffs are primary habitat

- Management to prevent human encroachment from nearby urbanized areas
- Highly limited distribution; 2 small populations known in subregion, additional surveys needed
- Annual/biennial monitoring of population numbers recommended
- Identification of potential restoration sites with suitable habitat within subregion and implementation of efforts to restore additional populations within subregion

chaparral beargrass[1] *Nolina cismontana*

- Relies on specific soil types (typically supporting chamise chaparral or coastal sage scrub)
- Over 90 % of known species distribution located in Central Coastal and Southern subregion
- Reserve design should protect specific soils where possible (mostly associated with Cieneba sandy loam, and Cieneba-Rock outcrop complex)
- Reserve design should attempt to protect major populations (i.e, Foothill Trabuco, Hot Springs Canyon, the latter is on already on land managed by the U.S. Forest Service)
- Soil specific surveys for additional populations
- Fire management likely necessary to promote reproduction

cliff spurge[1,3] *Euphorbia misera*

- Not confirmed from subregion, but populations known to be low in U.S.
- Reserve design should protect coastal bluff scrub, coastal bluffs, and steep coastal cliffs.
- Surveys necessary to establish presence/absence in subregion
- For confirmed populations, management consists of monitoring and control of invasive exotic plants

coastal golden bush[1,3] *Isocoma menzesii var. sedoides*

- Not confirmed from subregion; only one Orange County record, from Crystal Cove State Park
- Found on coastal bluffs and coastal bluff scrub; need surveys to establish presence/absence; easily detected in surveys
- Management consists of monitoring and control of invasive exotic plants

Coulter's saltbush[1,3] *Atriplex coulteri*

- One definitive record in Cristianitos Canyon along proposed transportation corridor alignment
- Additional surveys needed to establish presence/absence and habitat preference

heart-leaved pitcher sage[1] *Lepichinia cardiophylla*

- Known distribution in subregion: 2 populations reported near Trabuco Peak, others populations in Central/Coastal
- Associated with chaparral above 1,000 feet-- all appropriate habitat probably in the National Forest

many-stemmed dudelya[1] *Dudleya multicaulis*

- Requires xeric barrens, cobbly clay soils
- Species currently occupies half of historic range; concentrated in 5 core populations; western and southern areas important
- Reserve design should attempt to protect 80 percent of populations with minimum of 200-foot buffer from developed areas
- Transportation corridor may impact over 7,000 known individuals
- Management consists of species monitoring, exotics control in areas adjacent to development.
- Rare in Casper's Regional Park and Starr Ranch

ocellated Humboldt lily[1] *Lilium humboldtii ssp. Ocellatus*

- Key habitat for protection is oak woodland and stream courses in the foothill-mountain transition zone
- Most habitat is in Starr Ranch, Casper's Park and the National Forest; Foothill Trabuco unprotected
- Population monitoring needed to inform adaptive management

Parish's saltbush[1,3] *Atriplex parishii*

- Known from only two localities (both in Riverside County), however southern subregion has moderate chance of supporting the species

- Reserve design should attempt to include alkali habitats, swales, sinks, depressions, and grasslands with heavy alkali-clay such as in Canada Chiquita

- Habitat specific surveys needed during implementation

- Manage through population monitoring and invasive exotic plant control

Pacific saltbush[1,3] *Atriplex pacifica*

- Found rarely on coastal bluffs; may also be dependent on alkali habitats, swales, sinks, depressions and grasslands with heavy alkali-clay componants like *A. parishii*

- Suitable habitat known from coastal bluffs in subregion and in western lowland areas

Parry's tetracoccus[1] *Tetracoccus parryi*

- Specific to heavy gabbro-clay soils in chaparral
- Only known locality and most habitat within National Forest

prostrate spineflower[3] *Chorizanthe procumbens*

- Distribution very poorly understood in subregion

- Narrowly endemic to sandy areas

- Management needs include population monitoring and fire management

San Miguel Savory[1] *Satureja chandleri*

- Most of known habitat within National Forest

- Key habitats for potection are oak woodland, oak gallery forest, and shaded stream courses above 500 feet elevation

- Largest known populations of this species are within subregion in the vicinity of Upper Hot Springs Canyon and Chiquito Basin

- Management needs include monitoring and prevention of invasive exotic plants

southern tarplant[1] *Hemizonia parryi ssp. Australis*

- Populations known to be very reduced and restricted species-wide

- Found in moist alkali soils, alkali swales, sinks, depressions and grasslands with heavy alkali-clay componants such as in Canada Chiquita. Populations in Canada Chiquita some of the largest known and should be protected

- Management includes population monitoring and control of invasive exotic plants

sticky dudleya[1] *Dudleya viscida*

- Key habitats needing protection are shaded, steep rocky cliffs and canyon walls
- Most habitat appears to be within National Forest, Casper's Park and Starr Ranch, although appropriate habitat exists in Rancho Mission Viejo in southeast portion of subregion
- Unlikely to occur in western lowlands and foothillls of subregion

thread-leaved brodiaea[1] *Brodiaea filifolia*

- Declining rapidly over entire range
- Reserve should protect southern needlegrass grasslands and mixed native-non-native grasslands in clay soils
- Most populations known from western portion of southern subregion and should be protected if possible

Invertebrates

quino checkerspot[1,2] *Euphydryas editha quino*

- Locally extinct in Orange County
- Reintroduction should be enabled through reserve design and management by protecting open coastal sage scrub and host plants at a minimum of five locations
- Populations in northern Baja are likely source for translocations

Harbison's dun skipper[3] *Euphyes vestris harbisoni*

- Distribution very poorly known; surveys needed to establish presence/absence in subregion
- Key habitats are oak riparian drainages and adjacent seeps supporting *Carex spissa*, the larval host plant

Riverside fairy shrimp[1] *Streptocephalus woottoni*

- Only known subregional record from vernal pools in Saddleback Meadows
- Surveys desirable to determine presence absence of habitat
- Management requires maintenance of vernal pools and associated watersheds

San Diego fairy shrimp[1] *Branchinecta sandiegoensis*

- No confirmed records from subregion
- Requires vernal pool habitat; surveys suggested along with Riverside fairy shrimp
- Management includes maintenance of vernal pools and associated watersheds

A Further Note on "Umbrella Species":

Several vertebrate species in the subarea from this lists provided have broad requirements in both habitat and home range. They might serve as effective umbrella species for planning purposes; by providing for their requirements many other species will benefit. For example, landscape linkages designed for bobcats and mountain lions would work well for a number of other species. Or, conserving the nesting and foraging territories of some of the raptors will provide habitat for many other organisms. The species below have been identified in the reserve design principles under Tenet 1, but are worth describing here as well. In particular, the bobcat and the mountain lion are known empirically to serve well as umbrellas and there is extensive information on the breeding and foraging distribution of the three raptor species in the subregion. The following species can be important in identifying the potential reserve network:

American badger	*Taxidea taxus*
bobcat	*Lynx rufus*
coyote	*Canis latrans*
mountain lion	*Felis concolor*
red-tailed hawk	*Buteo jamaicensis*
great horned owl	*Bubo virginianus*
golden eagle	*Aquila chrysaetos*
barn owl	*Tyto alba*

Task III: Principles for Adaptive Management

This section develops an outline and principles for an adaptive management program for the subregional NCCP. It begins with a discussion of general land management principles and relates them to the key conservation goals of the NCCP. It discusses adaptive management and its fundamental elements to provide context for the specific suggested management program goals for the southern subregion. The report then outlines potential steps to implement an adaptive management approach for the subregion, based on the target landscape, species and natural communities of particular concern. Through a case example, the report shows how a community-specific model can be used to develop a set of testable management hypotheses. A discussion contrasting research, monitoring and management follows, leading to a suggested structure for the subregional program, tasks, responsibilities, products, and potential schedules. The section concludes with a discussion of funding strategies for management and research in the subregion. While the science advisors did not consider the allocation of responsibilities of funding adaptive management, the importance of funding was recognized and the program is believed to be financially feasible.

Overall Land Management Goals

There is a recent growing trend toward managing natural lands at the ecosystem level. The science advisors acknowledge and support this focus for adaptive management as the scale most likely to produce success for the conservation program. To do this, it is important to set some broad overall goals for land management. The advisors recommend that the management program of the subregional NCCP seek to achieve the following overall goals. The management activities outlined in this framework are intended to assist in meeting these goals:

1. Ensure the persistence of a native-dominated vegetation mosaic in the planning area.

2. Restore or enhance the quality of degraded vegetation communities and other habitat-types consistent with overall conservation goals for species and natural communities.

3. Maintain and restore biotic and abiotic natural processes, at all identified scales, for the planning area.

Although overall goals are extremely important to point the program in the right direction, they provide little guidance in defining target conditions for specific habitats and management activities on individual parcels. The following sections discuss development of a program aimed at the above goals while addressing species and community specific objectives and conditions.

Keys to Adaptive Management

This section briefly describes the emerging science of adaptive, ecosystem-level management as it relates to the reserve design and species conservation principles in the previous two sections. The science advisors identify the key elements of an adaptive management program and discuss in detail the process of setting objectives for management and development of natural community models that help initiate the adaptive process. This section also points out the crucial nature of biological monitoring as part of an overall management program.

Ecosystem management presumes a working knowledge of system function and structure. Yet we know comparatively little about how coastal scrub and associated habitats function and the roles of many species in this process. Coastal sage scrub received very little attention from researchers until the late 1970's (see O'Leary et al 1994). As a result, it is difficult to initiate a precise long-term management program from the beginning of a conservation plan. The management program by necessity should be iterative -- continually refining initial management strategies according to information learned during the process of management and monitoring. This is particularly true for the effects of habitat fragmentation on the persistence of coastal sage scrub and associated species -- an important, but relatively unstudied issue.

A formally structured protocol for this learning process, termed "Adaptive Management," directs management and monitoring actions to optimize information acquisition and improve management in feedback steps (Lee 1993:9). Adaptive management assumes that managers will take actions (including leaving habiats undisturbed) that modify present ecosystem structure and function with the aim of moving the system towards a more desirable state or keeping it within some acceptable limits. This process takes advantage of the information generating opportunities that management activities create (Fig 1). The process is based on a feedback loop in which

individual management objectives are flexible and can be changed as new information becomes available or as conditions or priorities change (Schroeder and Keller 1990, Walter and Holling 1990). Adaptive management is iterative, meaning that managers constantly monitor and evaluating the consequences of their activities and refine them. This approach to conservation allows land management to proceed in the absence of complete initial information.

The fundamental elements of an adaptive management program are:

1. Setting Management Objectives

Before specific management activities can be identified for a parcel, habitat or landscape, planners and managers should identify desired future conditions. These are the initial objectives on which management activities are undertaken. Objectives should be measurable. They should incorporate the diverse views of stakeholders and specific legal requirements for conservation as well as recognize the limits of such factors as available funds and land ownership. It is important that objectives are set with full recognition of the economic, social and political context in which the conservation program takes place. Stakeholders and land managers should define site specific objectives with review and input from scientists with expertise.

The advisors propose the following issues as a good starting point in objective setting (after Schroeder and Keller 1990):

- The rarity of a species or community
- Importance of endemic species/communities
- The variability in abundance of species/communities
- Keystone species
- Species or communities that are good indicators of change in the ecosystem of concern
- Defining and managing for "natural conditions"
- Cumulative effects of isolated impacts
- Major landscape-level changes

It is also important that objective setting consider the multiple scales affected by the conservation program (global, regional and local). For example, an objective to manage for the maximum absolute number of species (species richness) might not be desirable if it results in loss of a rare species not found elsewhere (Samson and Knopf, 1982; Noss and Harris, 1986). Setting objectives with an eye to regional context allows greater contribution of local projects to overall biodiversity conservation. This point emphasizes the need to have an overall assessment of the NCCP Region and various tradeoffs at the subregional level such as provided by the NCCP Regional Science Advisors.

2. Preparing Management Plans and Conceptual Models

Using the objectives identified in Step 1 and based on the best initial information available, management plans for reserve parcels and habitats should be prepared. A concept of how the natural system functions and responds to various management treatments is also important to creating management plans. Managers should develop these conceptual models of each focal habitat-type before developing management plans. In Figure 2, we illustrate a conceptual model

of upland habitats under three management scenarios. This simple conceptual model describes the changes in the system (based on current knowledge) resulting from different management treatments, and it aids in identifying which treatments to use to bring about the objectives described in Step 1. This qualitative, relational model represents mostly assumptions or hypotheses that can then be tested through management. Monitoring the effects of that management can provide information allowing both the conceptual model and management activities to be refined over time to better meet the overall goals of the conservation program.

3. Identifying Uncertainties and Knowledge Gaps in Management Plans

To continue creating an adaptive management program, it is important to identify early gaps in knowledge about the natural system that lead to uncertainties about the effectiveness of the management plan in achieving desired objectives. These gaps point out specific areas for scrutiny during monitoring or weaknesses in the model. For example, we may not know how what happens to a natural community if fire is applied too frequently (a weakness in the model) or we may simply not know what role fire plays in the community at all (a weakness in basic research).

The purpose of identifying gaps in models and knowledge is to translate them into a set of questions that can be addressed through monitoring and/or research. This experimental approach to management recognizes the limitations of current knowledge about natural communities and informs constant improvement of management efforts. As knowledge gaps are identified and hypotheses are tested, conceptual models and management plans get better at achieving the objectives of the conservation program.

4. Monitoring the Management Program

Assumptions about the effect of management actions in initial management plans and their ability to achieve desired objectives should be evaluated through ongoing monitoring. The results of monitoring, when compared to the hypotheses in the conceptual natural community models, are what allow refinement of management activities. The key to monitoring, then, is what is monitored and why. *The biological monitoring program should be developed specifically to measure and evaluate the effects of management activities. It should identify and measure variables that permit iterative refinement of the management program*.

The monitoring program should be structured so that the information collected allows both the determination of factors crucial to permit compliance and identification of trends that allow the management program and plans to be adapted. For example, one could monitor California gnatcatchers (*Polioptila californica*) by either counting absolute numbers of birds or by measuring key habitat variables. After a decade of monitoring, the first method would result in simply 10 years of population numbers with no sense of the cause of trends. The second method would give as accurate a picture of population health, but would also pick out trends that could be addressed through adapting management. Either method might suffice for permit compliance regarding coverage of gnatcatchers.

The biological and management monitoring program should include both routine long-term observations and management experiments since some crucial assumptions about cause and effect of management may not be easily tested by simple observation. These are important

activities, and should be integrated into the management program in the context of ongoing management. Done creatively, this can occur without increasing or complicating management activities. Furthermore, some questions are better explored in more traditional scientific studies and the answers to these questions may be critical for success of the conservation management program. A successful adaptive management program should therefore include both routine observational monitoring and experimental management actions and monitoring designed to test assumptions beyond simply passive observation, supplemented by research to answer fundamental questions of ecosystem function or processes. The fundamental questions for biological monitoring to inform adaptive management should be: which attributes of the system should be measured, and when should the alarm bells go off that unacceptable change is occurring?

5. Incorporating Monitoring and Research Results Into Revised Management Plans

As discussed above, designing management plans as assumptions or hypotheses to be tested allows immediate biological and permit compliance needs to be met while utilizing management as an experimental treatment. Analysis of the ecological information gathered in the monitoring process should be fed back into revised management plans, and new hypotheses posed as new information becomes available. Over time, both knowledge (as reflected in conceptual natural community models) and management activities are refined and are better able to achieve the overall goals of the conservation program.

Adaptive Management for the Southern Orange County Subregion

The previous section described the fundamental steps in creating any adaptive management program. Program success depends on development of objectives and initial natural community conceptual models based on current information, and feeding these into management plans that can be tested and refined over time as knowledge gaps are filled through monitoring. The science advisors recommend that the management program for the Southern Orange NCCP follow this approach. This section identifies suggested target communities for management planning in the subregion as well as the natural processes that should be part of the conceptual models. The following sections identify additional pieces of the adaptive management program.

Two levels of planning should be conducted for the subregion. Conceptual models and initial management plans should be completed for each target natural community-type, and an overall qualitative model developed for the entire subregion to identify and coordinate interactions and management activities among natural community-types. These planning exercises will define current knowledge, identify gaps and direct initial management and monitoring activities.

Because of the biological complexity of the subregion, the science advisors believe that the number and scope of the conceptual models should be limited for practical purposes. In addition to the overall subregional model, conceptual models should be developed for the following generalized vegetation categories. These models should also include where appropriate the habitat relationships and management conditions identified for species from Group 3 of the Species Conservation Principles:

- Riparian
- Shrublands

- Woodlands
- Grasslands
- Wetlands
- Selected transitional habitats

The conceptual models developed for the subregion and generalized vegetation categories should also carefully consider the effects on preserved areas created by the wildland/urban interface that currently exists and that will be created by the development permitted under the NCCP. In particular, the following two factors should be considered:

1. Edge Effects

Encroachment from inhospitable adjacent land uses and other disturbances (e.g. feral cats, species collectors, etc.) may cause otherwise suitable habitat to be unoccupied by species of concern. Wildlife species often are extirpated from a proportion of high quality habitats near urban areas. The extent of this extirpation is highly variable and usually cannot be detected by vegetation or habitat element measurements (see Bolger et al 1997, Scott 1993).

2. Habitat Fragmentation

Converting parts of a natural landscape to developed areas disrupts patterns of dispersal or movement (e.g. many small mammals will not cross roads). Regional habitat patterns may be changed to the point that dispersal to some parcels of suitable habitat is insufficient to keep it occupied by a species of concern, even if those parcels are protected and remain relatively free from disturbance. For example, bird occurrence at Foothill Ranch (Scott unpublished data 1989 through 1996) adjacent to the Southern Orange County NCCP area indicates a high rate of species turnover in some patches of coastal oak woodland and sage scrub habitats. Dispersal between patches compensates for high mortality (perhaps due to Factor 1 above) and/or random extirpation. Habitat loss to land development further reduces availability and pattern of habitat patches in the landscape, reducing the likelihood that individual patches will be recolonized. The concept that there may be a critical threshold for the density and distribution of source populations is poorly understood.

Because of the importance of natural processes in maintaining species and habitats, and also due to the introduced factors illustrated above, it is critical that the adaptive management program address landscape issues and processes. When creating conceptual models for vegetation categories or habitat types it is recommended that the following processes be considered:

- Fire
- Hydrology/flooding
- Invasion of exotic species
- Erosion/sediment transport
- Recreation/Visitor use
- Encroachment/edge effect

Example Conceptual Natural Community Model - Coastal Sage Scrub

To assist subregional planners with modeling the vegetation categories identified above, the science advisors have developed and provided this preliminary model of the coastal sage scrub community based on current knowledge. The model depicts changes in species richness, successional stage and habitat-type over time in response to the varying effects of fire, invasions of exotic species, and other impacts such as grazing. This community-level information can be combined with other upland communities to define interactions and management activities across a broader portion of the landscape. The coastal sage scrub model is depicted in Figure 3.

The vegetative composition of coastal sage scrub has been shown to consist of relatively few dominant shrub species, with the majority of species occurring in the herbaceous understory (Westman 1981). Species richness in coastal sage scrub is typically highest in the first few years following a fire. This is attributed to the establishment of specialized fire-following annual grasses and plants. After a peak in local species diversity during a 5-10 year period, there is a general decline in understory herb species (and overall species diversity) over time. This may be attributed to dominant shrub species increasing in cover, thereby shading out the understory herbs (Keeley and Keeley 1984). Once the dominant shrub species are established, they will continue to re-seed and re-sprout in the absence of fire. The ability of coastal sage scrub to continually re-seed or re-sprout in the absence of fire suggests that a stand of sage scrub is typically of mixed age and leads to the hypothesis that the natural fire interval for sage scrub may be longer than is commonly assumed.

Post-fire shrub and herb diversity can vary depending on natural and anthropogenic or non-natural disturbance regimes. Westman and O'Leary (1988) found that sites adjacent to grazing tend to become dominated by annual grasses with poor recovery of dominant shrubs. In addition, short fire intervals (i.e. less than 20 years) may greatly reduce or eliminate some important or rare species, while longer fire intervals allow for the maintenance of species diversity (Malanson 1985). The example model demonstrates these effects by showing that species diversity declines over time in early and mid-successional sage scrub subject to either a repeat fire event or grazing. Increased dominance by non-native grasses as a result of grazing or a repeat fire event may in turn increase the fire frequency in that stand of sage scrub. As shown in the model, increased fire frequency may result in loss of species diversity and eventual type conversion of that stand to non-native grassland.

The example model shows that a late successional stand of sage scrub that has not been altered by grazing has the best chances for maintaining species diversity after a fire. The condition in a good portion of the subregion is the opposite, however, since much of the area is subject to grazing, and suggesting that fire management programs for sage scrub in the southern subregion should consider and plan for the potential effects of exotic species invasions.

Management Hypotheses for Coastal Sage Scrub

Based on the model developed above and illustrated in Figure 3, the following are examples of initial hypotheses that might be included in an initial management plan and then tested through the management and monitoring process. Some of these assumptions might be better addressed through research outside the scope of the NCCP, but the management and monitoring program

should creatively maximize the number that can be tested through the adaptive management and monitoring program.

Hypotheses:

1. Fire intervals of less than 10 years will result in a decrease in diversity of native species and an increase in the frequency of non-native grasses and forbs.

2. Winter and spring fire events will result in a decrease in the density and diversity of native shrub species.

3. Grazing in post-fire, early and mid-successional coastal sage scrub will result in decreased species diversity over time.

4. An established (late successional) stand of coastal sage scrub that has not been subject to grazing will have a higher overall post-burn native species diversity than a same-aged stand that has been grazed.

5. Structural and compositional components of required habitat, for selected species, will decline in quality with fires occurring at least every 10 years.

6. Habitat quality, for certain associated species, will declined with grazing or grazing/fire events during early seral stages of succession.

The Role of Research in Adaptive Management

To date, ecologists and land managers have rarely attempted to synthesize the effects of management actions on landscape level projects. There is also relatively little basic information about how the system reacts to both natural and anthropogenic events or management techniques. This does not mean that sound biological management is impossible, only that it must be iterative. By the same token, research efforts have not been coordinated well to inform management, and the quality of conceptual ecological models and management activities have not progressed linearly. A recent conference on management and research in NCCP attempted to address this issue, and the science advisors recommend consideration of the report produced by the "Core Group" of the conference as a means to integrate these two issues.

In addition to the management/monitoring feedback described earlier, ecological research can be an effective way to fill the gaps in knowledge needed to refine management activities. For example, a management objective might be to preserve a particular natural community without significant change in its function. Because of variable climate and normal patterns of successional change, it is reasonable to state the objective as "no more change than would be expected given natural succession and the effect of variables like rainfall and temperature. But if we don't know how rainfall and temperature effect the system at a basic level, it is hard to identify changes in the system and how to compensate for them by adapting management. For example, complete loss of plant cover from a fire may be of no long term importance or it may be disastrous, depending on the system and the circumstances. This basic knowledge is gained through research. The advisors believe that the principles for adaptive management outlined here will make the most effective use of the benefits of both biological monitoring and research.

The following list focuses research on unanswered questions most affecting long-term conservation outcomes in Southern Orange County. *The NCCP management and biological monitoring program should be creatively designed to answer as many of these questions as possible*. The rest should be the subject of research early in implementation. The science advisors do not suggest a responsible entity for this research, only that the information is fundamental to development of a robust adaptive management program.

- Inventory and landscape pattern of CSS, grasslands, oak woodlands, riparian, chaparral.
- Trends in species composition and distribution in the above 5 communities
- Dispersal characteristics and landscape corridor use by focal species
- Demography, population viability and genetic or taxonomic analysis for selected target species
- Surveys and autecological studies of sensitive species (Category 3 list from Task 2)

Steps and Products for the Southern Orange County NCCP Adaptive Management Program

This section identifies a series of products and steps to creating an adaptive management program for the subregion. It also provides suggestions on priority and hierarchy. All these elements should be completed for the adaptive management program to operate effectively.

Elements of the Adaptive Management Program

As we have illustrated in this document, an adaptive management plan for the Southern Orange County subregional NCCP should contain the following elements (in hierarchichal order):

- Overall Land Management Goals
- Community or Species-Specific Management Objectives
- A Subregional Conceptual Model[1]
- Conceptual Ecological Models For Identified Natural Communities[1]
- Clearly Articulated Management Hypotheses
- Identification Of Knowledge Gaps in Models and Techniques
- Management Plans for Specific Natural Communities[2]
- A Landscape Plan Coordinating Overall Reserve System Management[2]
- Biological Monitoring Plan With Suggested Priorities To Address Management Hypotheses (what to measure, what to test)

The biological monitoring section of the NCCP plan should coordinate monitoring of management effects on sensitive species identified in Task 2 (the Species Conservation Principles). The vegetation specific plans and the landscape-level plan should address the following management issues:

- Fire
- Grazing
- Exotics Control

- Restoration
- Recreation

Ongoing or Continuing Management Activities

Even in the current absence of a well defined adaptive management plan some management activities should be initiated or continued. These activities should focus on maintaining the quality of existing habitats and restoring areas that have been highly degraded. All these activities should occur in an adaptive context upon completion of the adaptive management program.

For some management issues there is sufficient information to identify extreme threats and effective actions. For example, aggressive weed species are an existing extreme threat. Uncontrolled spread of invasive weeds such as artichoke thistle have the potential to quickly degrade (and have degraded) protected habitats and may reduce future conservation options. With proven control technologies in place for these threats, the science advisors recommend that active weed eradication commence or continue for some species immediately and not wait for the development of an adaptive management plan. Particular emphasis should be placed on both artichoke thistle (*Cynara cardunculus)* and arundo (*Arundo donax*) with the option for control of other species as appropriate. Technologies for control of these species may include, but should not be limited to herbicide treatments, prescribed fire and prescribed grazing. Weed control efforts should be subject to approval by existing management committees, or by a technical advisory committee if one is formed when the NCCP is approved.

The use of managed fire should be continued for grasslands and chaparral communities in the subregion. The science advisors believe that sufficient documentation of fire effects in these communities currently exists to plan ecologically sound management actions. Management burns should be coordinated with technical expertise and advice. Additional burning may be considered for scenarios where it may provided significant fire protection for sensitive resources, aid in the control of invasive weeds or provide an effective pre-treatment for restoration.

It is assumed that current levels of cattle grazing will continue on the site during the development stages of the adaptive management plan (and potentially beyond, depending on desired future habitat conditions) and grazing will be an important process managed through both the landscape-level plan and the specific natural community plans (see above). In the interim, the conservation outcomes of the NCCP would best be served by managing grazing allotments with strategies similar to those outlined in the grazing plan developed for the Irvine Open Space Reserve. Additional grazing of cattle, sheep or goats could be considered for weed control or fire protection objectives.

Restoration of highly degraded sites should also continue prior to completion of an adaptive management plan. Experimental or management treatments aimed at restoring non-native annual grasslands to coastal sage scrub should be highlighted in this process.

Implementing Adaptive Management in the Southern Subregion

This section offers recommendations about the issues and principles encountered in operating an adaptive management program and advice on the progression of tasks from immediate to long-term. For such an ambitious program to work effectively, there must be a blend of cooperation,

objectivity, expertise, and critical evaluation. The science advisors note that the program administrative structure within which adaptive management takes place is fundamental to long-term success.

Without making conclusions about the administrative structure for implementing the Southern Orange County NCCP, the science advisors strongly recommend that a number of important issues for the adaptive management program be considered when the structure is created. The advisors also recommend that the advice and input of experienced, objective experts be sought frequently in the continuing administration of the adaptive management program.

Program Issues:

There are several issues at the program level that should be addressed through administration of the adaptive management program. These are:

- Coordination of resource agencies and technicians/scientists in conducting reviews and updates of adaptive management program goals and objectives
- Preparation of periodic reports on the management program
- Review of management plans
- Allocations of funds for management

Technical Issues:

These technical issues are essential to ensure ongoing effectiveness of the adaptive management program:

- Reviewing and updating program goals, objectives and techniques based on monitoring results
- Identification of long-term (10 year or more) and short term management priorities
- Development of long-term management and monitoring plans
- Review and establishment of research needs/coordination with researchers
- Development of plans and budget requests for management activities and biological monitoring programs
- Solicitation and evaluation of proposals received for management work
- Review of reports prepared by contractors/researchers
- Evaluation of effect of proposed modifications to reserve design

The NCCP Regional Science Advisors

The NCCP Regional Science Advisors were established by the state of California to provide objective expert input and examine programmatic science issues to provide advice and a regional perspective for the entire NCCP regional program. For this reason, the Southern Orange County science advisors believe that this group (or a similar one) should be integrated as closely as possible with the ongoing management program for the subregion to provide a regional biological context and perspective for management activities and progress under the plan and to use the information gained from the Southern Orange NCCP management program to identify regional research and management issues and priorities. The regional science advisors would also be effective in bringing the experiences and knowledge developed in implementation of other subregional plans to bear on the Southern Orange adaptive management process. The significant bioregional questions addressed by this group are crucial to success both at a subregional level and for the NCCP Region as a whole.

Funding Adaptive Management for the Southern Orange Subregion

The science advisors have avoided constraining their recommendations based on assumptions about funding. However, they acknowledge that funding the adaptive management program will be an important consideration. Most important, funding needs are not consistent through time. As knowledge is gained about the function and condition of a particular natural community, the cost to manage it becomes more efficient. One factor that may reduce the overall cost of the program is how closely the principles in Tasks 1 and 2 are followed (see below). The advisors offer the following suggestions on funding needs for an adaptive management program.

The advisors recommend that the adaptive management program be acted on and funded in a two phase process; 1) a relatively intense, shorter term program to create and refine models, identify gaps in knowledge about the systems, change management techniques as necessary and address specific immediate threats such as exotic and invasive plants; and 2) a longer term, less intense program with a lower level of permanent funding to monitor management activities, processes and trends once the techniques and models have been refined. Most of the experience gained and refinement necessary for the management program and much of will be gained in the early years of implementation. Underfunding the initial years of implementation will ensure that the management program will be continually "behind the curve" on many crucial issues such as restoration and exotic species control, with potentially negative consequences for the long term success of the program. On the other hand, intensive management and restoration early on is likely to be rewarded with a less costly "maintenance" level of management over the long term.

It is assumed that the funding for adaptive management in the subregion will be derived from an endowment or similar source. The science advisors recommend that planners consider structuring the endowment to provide whatever funds are necessary to carry out the crucial short term needs identified above and then stabilize the endowment at a level sufficient to fund ongoing, long-term monitoring of processes and trends, rather than making the entire endowment a non-wasting, perpetual source that may prove to be inadequate to establish the adaptive management program in the short term.

Conclusion

The science advisors intend that the principles for reserve design, species conservation and adaptive management described here be part of the foundation of a comprehensive program of conservation for the southern Orange County NCCP subregion. The first layer of this overall program is a reserve system based on strong design principles. For species not adequately protected by well-designed reserves, a layer of species conservation principles provide additional security. Adaptive management and targeted monitoring designed to examine and respond to changing conditions or unexpected consequences and develop crucial conservation information over time is the third layer in the hierarchy.

The principles described in this report are intended to coincide closely and be taken collectively, not in part. Many of the reptiles and amphibians, for example, do not need individual species-level action to conserve them, but they depend on a good reserve design, management, and careful monitoring over time to ensure that management activities are successful. The three sets of principles thus work together to enable a strong conservation program for the subregion.

By the same token, a reasonable final reserve design may not address each principle in its entirety. The science advisors have described all the important objectives for creating reserves in the subregion, but recognize implicitly that there will be tradeoffs in arriving at a final overall design. It is the expectation of the advisors that the principles for reserves and species outlined here will be followed as closely as possible given planning constraints and will be the foundation for discussions and tradeoffs among the program stakeholders and the county prior to any action by the county.

In some cases, the reserve design alternative analysis may encounter conflicts between principles, such as between a riparian connector versus a ridgetop connector, or a large, fragmented habitat block versus a smaller, intact habitat block. The science advisors have tried to provide as much guidance as possible in anticipation of these issues. The advisors hope remaining inconsistencies can be illustrated in various reserve design configurations so that the consulting team can recommend which alternative is preferred. Within the scope of work conducted by the science advisors, it is not possible to unequivocally weigh each of the principles against the others.

The science advisors have attempted to describe all the important objectives for an adaptive management program for the subregion, but also acknowledge that other factors will influence the scope and objectives of the program, especially the specific management actions taken on individual habitat parcels. Given these realities, the advisors have attempted to identify rough priorities for management that will guide these activities. Since adaptive management is so vital to the biological success of the NCCP, however, it is the hope of the science advisors that the outline and framework presented here will be followed as closely as possible.

The advisors note strongly that the need for and cost of management is closely tied to the reserve design and species conservation actions taken in the NCCP plan. For example, the more systematic disturbance created by the reserve design (e.g. fragmentation that will lead to encroachment) the more difficult and costly the adaptive management program must be in order to compensate for it. By the same token, a reserve design that adheres closely to the principles developed in Task 1 can be more cheaply and efficiently managed.

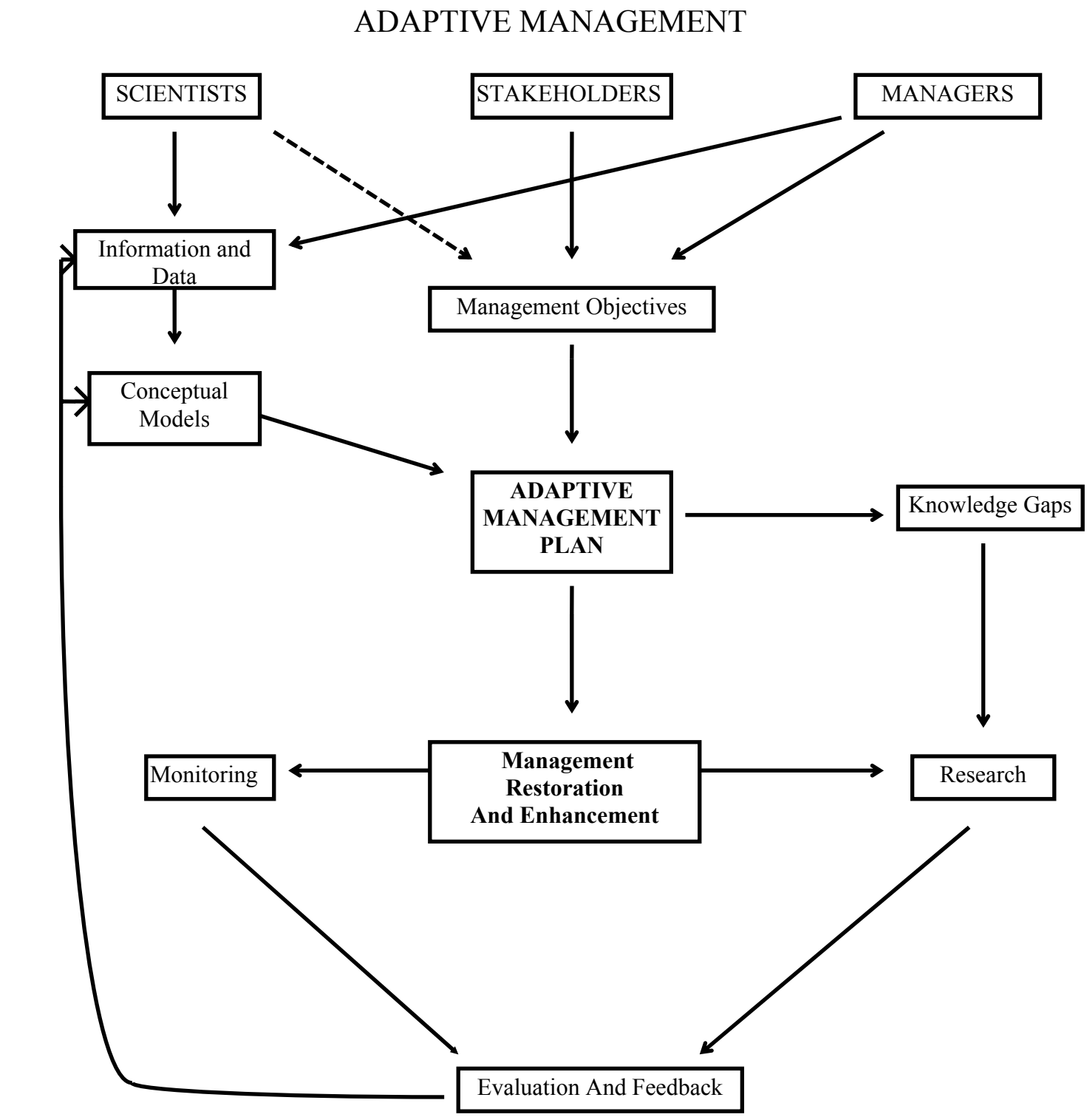


Figure 1. Adaptive management flow chart.

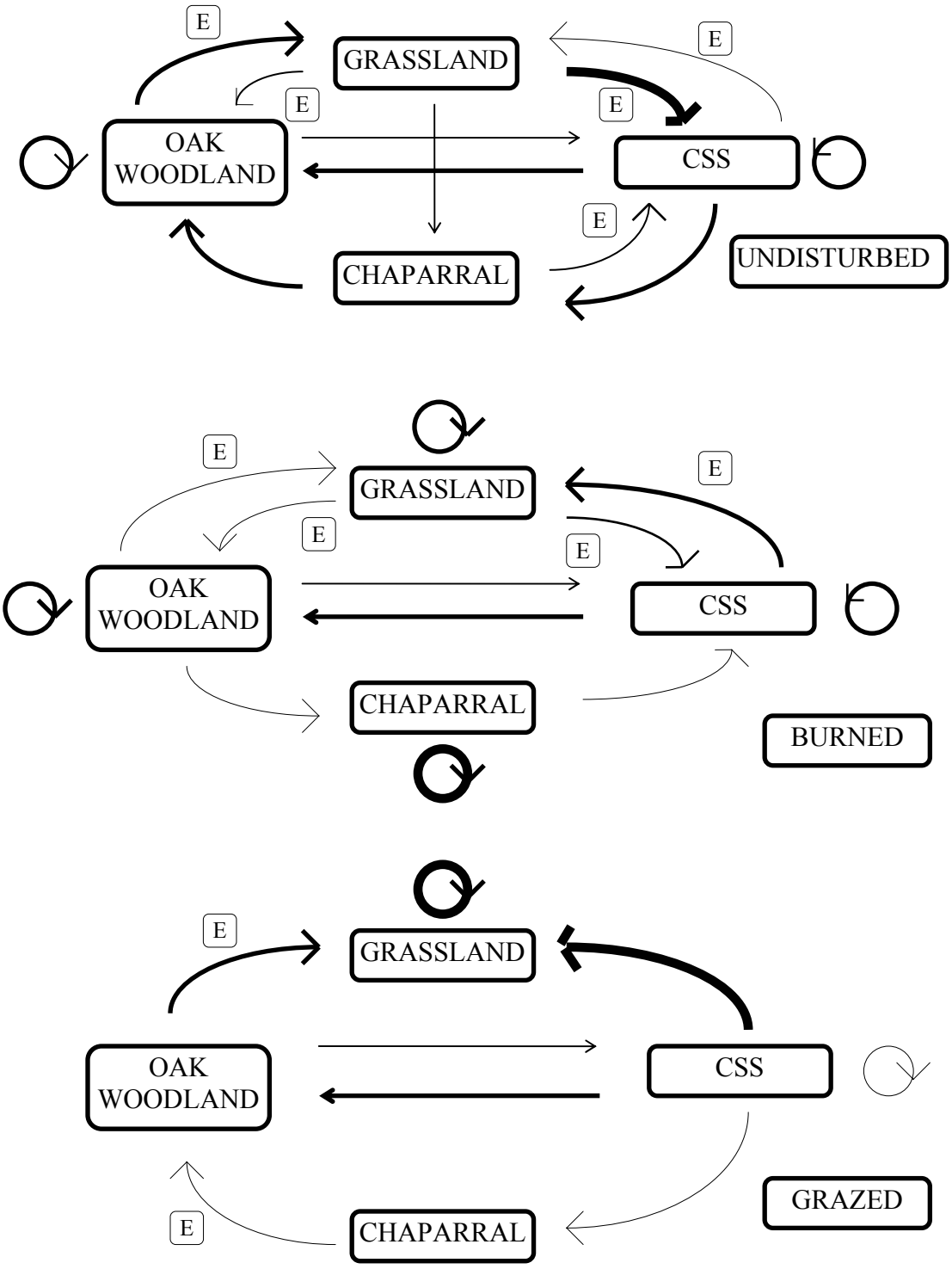
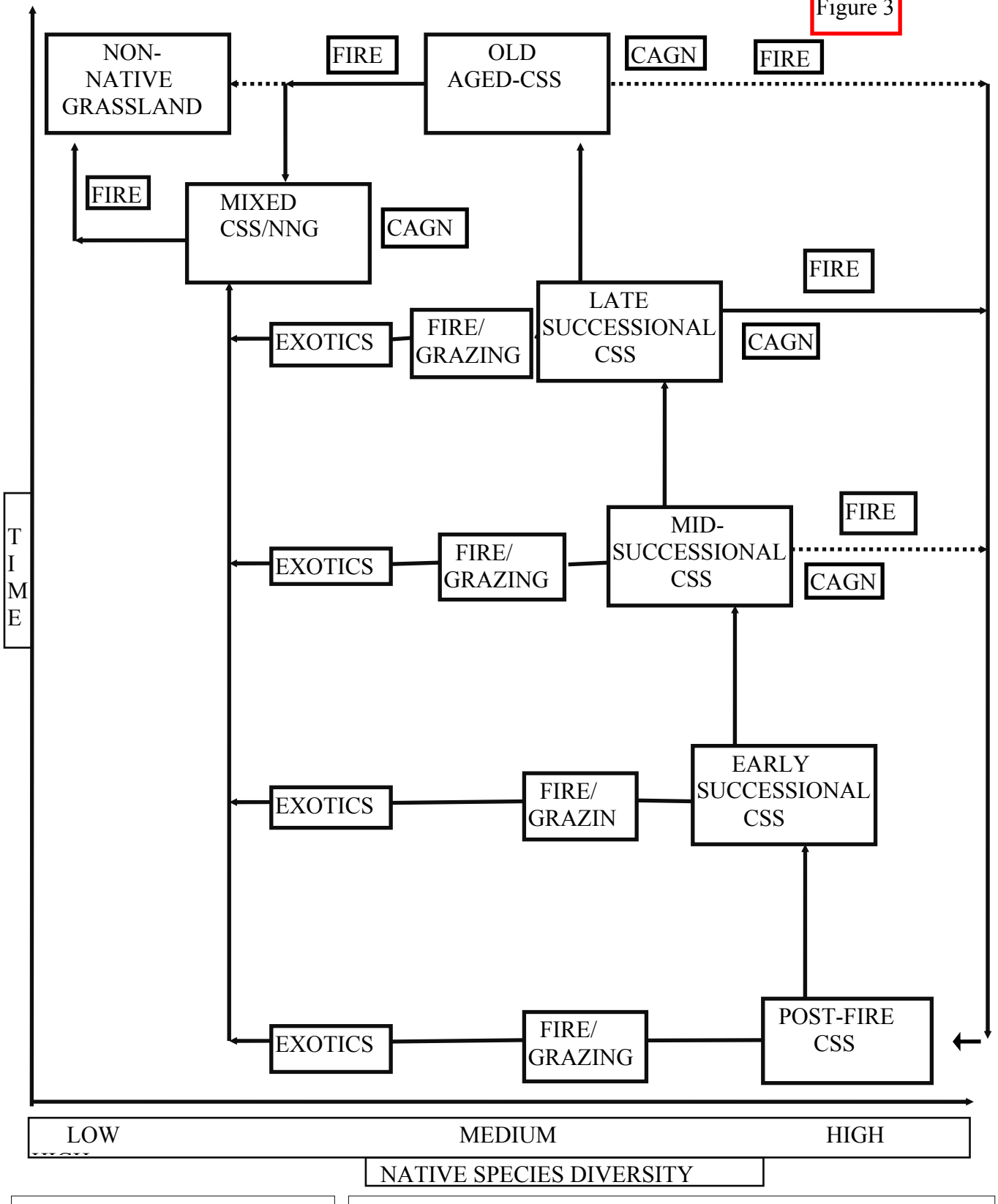


Figure 2. State-transition models for upland habitats under three management scenarios. Line thickness is proportional to the probability of that change. E refers to significant invasions of exotic species.

Figure 3



LEGEND
PRIMARY PATH
SECONDARY PATH

CONCEPTUAL COASTAL SAGE SCRUB HABITAT MODEL

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